Sept./Oct. 1989 $2.00

MONTANA OUTDOORS

OUR POINT OF VIEW

MIKE LOGAN

WATERFOWL POPULATIONS, ESPECIALLY DUCKS, NEED OUR HELP! In this issue of *Montana Outdoors*, Jeff Herbert and Tom Hinz, our waterfowl biologists, describe the problem, the opportunities, and two cooperative joint ventures in Montana that are attempting to turn this situation around.

I've been involved in the waterfowl business most of my professional career. It's important to me and to many conservationists. This year Montana stands out as a real bright spot for waterfowl production. Montana's future contribution to the international waterfowl resource can be significant. This department will play an important role in developing that potential contribution, but not without the cooperation and commitment of private landowners and private conservation organizations like Ducks Unlimited and The Nature Conservancy. These private individuals and organizations are already a big part of the North American Waterfowl Management Plan. In this state they have been joined by the U.S. Fish and Wildlife Service, Bureau of Land Management, Bureau of Reclamation, Department of Natural Resources and Conservation, Department of State Lands, and FW&P. The key word is cooperation, and with it we can be a part of a tremendous success story.

With duck populations so low, now is when they need you the most. Here is how you can help: Continue to hunt but follow the rules. Buy federal and state duck stamps that support waterfowl habitat conservation. Support Ducks Unlimited and other conservation organizations that provide habitat for waterfowl. Most important, don't lose interest and don't drop out. If we are to succeed, we need you as a partner in conservation—now more than ever.

K.L.Cool
Director
Montana Department of Fish, Wildlife & Parks

Turn to page 15 for an article on "The Year of the Big Dry."

State of Montana
Stan Stephens/Governor

Fish and Game Commission
Errol Galt/Chairman
Greg Barkus/Vice Chairman
F.W. Howell
Bob Jensen
William Stratton

Department of Fish, Wildlife & Parks
K.L. Cool/Director
Ronald G. Marcoux/Deputy Director
Gene Allen/Associate Director

Conservation Education Division
Ron Aasheim/Administrator
Vince Yannone/Assistant Administrator

Montana Outdoors Staff
Dave Books/Editor
Kay Morton Ellerhoff/Associate Editor
Donita Sexton/Art Director
Tara Gallagher/Intern

Montana Outdoors (USPS 360 280), the official publication of the Montana Department of Fish, Wildlife and Parks, is published bimonthly (January, March, May, July, September, and November). Contributions (manuscripts or illustrations) are welcome with the understanding that the department or the editor cannot be responsible for loss or damage. All contributions will be published at the discretion of the editor. For subscription information, phone 800/678-6668 (toll-free). Subscription rates are $7 for one year, $12.50 for two years, and $17 for three years. (Please add $3 per year for Canadian subscriptions. All other foreign subscriptions, air mail only, are $22 for one year.) Individual copies and back issues cost $2 each. Although *Montana Outdoors* is copyrighted, permission to reprint articles is available by writing our office or phoning us at 406/444-2474. All correspondence should be addressed: *Montana Outdoors*, Department of Fish, Wildlife and Parks, 1420 East Sixth; Helena, MT 59620. ©Montana Department of Fish, Wildlife and Parks, 1989. All rights reserved. Indexed by States' Periodical Index, 1660 Smithville Road; Havre, MT 59501.

Postmaster: Send address changes to: *Montana Outdoors*, Department of Fish, Wildlife and Parks, 1420 East Sixth; Helena, MT 59601
Second-class postage paid at Helena, MT 59601, and additional mailing offices.

MONTANA OUTDOORS

Sept./Oct. 1989
Volume 20, Number 5

FEATURES

2 A Partnership for the Future
by Jeff Herbert and Tom Hinz
Those who thrill to the sight of ducks on the wing should support the Montana Prairie Pothole Joint Venture.

6 Perspectives—"Musselshell Magic"
by Wade Fredenberg, illustrated by Randy Bishop
Join the author in a year-long fantasy trip down a stream on the eastern Montana prairie.

15 The Year of the Big Dry
by Tom Palmer
By early spring, there were warnings that the furies were conspiring to let us have it good.

18 Pushing Forward on the Bitterroot
by Ron Spoon and Dennis Workman
By taking an active interest in water management, residents of the Bitterroot Valley have come one step closer to resolving conflicts over use of their most valuable resource.

27 The Digging Machine
by Tara Gallagher
In Blackfeet legend, the striped-face badger possessed his own great strength and spiritual powers.

30 "The Last Best Place"
paintings by Robert A. Kercher, Jack Hines, Robert F. Morgan, and Gary Carter
A pictorial book review of this Montana anthology.

DEPARTMENTS

11 Catchall
12 Book Reviews
14 Contributors
23 Readers Respond

COVERS

Front Cover—Townsend photographer **Paul Updike** has captured what many Montana anglers designate as the peak experience of the whole fishing calendar: fall fishing.

Back Cover—Everyone who saw it termed the Capital flower display a "capital idea." **Tom Warren's** photograph shows you why the display was one of the most photographed spots in the state during Centennial summer.

DAVE BOOKS

A PARTNERSHIP FOR THE FUTURE

by Jeff Herbert and Tom Hinz

The mallard pair swings in unison in the April wind. With wings cupped and feet extended, hen and drake settle onto the prairie marsh. The pair has returned to the breeding grounds to establish its territory on this wetland complex. Already, the hen has flown repeatedly over the surrounding area in search of a suitable nest site. She is looking for tall, dense grass and forbs, produced during the previous growing season and attractive because they conceal hen and nest with overhead and lateral cover.

* * * * *

The hen faces an all-too-familiar problem for prairie-nesting ducks. A succession of dry years on the prairies has significantly reduced the habitat base that supports breeding ducks. Drought has not only decreased the number of ponds available to the mallard pair but also has reduced the amount of secure nesting cover in the uplands. Many upland areas have been farmed intensively to the edge of the wetland basins, and the only remaining vegetation grows along the edges of the ponds.

The mallard hen eventually will select a nest within that narrow band of cover. She will lay about one egg a day until her clutch of 10 eggs is complete; then she will begin the 26 days of incubation. Unfortunately, she probably won't succeed.

Because upland-nesting ducks have been forced into smaller and smaller areas, they and their nests have become more vulnerable to the mammalian and avian predators that hunt there. High nest predation rates and low nest success rates are symptoms of poor habitat quality and quantity in the major duck-producing regions of the north-central United States and prairie Canada.

Perhaps the problem is best understood by looking at figures. Estimates say that for the midcontinent mallard population to remain stable, only 15 nesting hens of 100 need to successfully hatch their eggs and see their brood to flight stage. Yet researchers have documented the current success rate for mallard nests in portions of the Dakotas and prairie Canada at only 8% to 10%. Obviously, poor recruitment of ducklings is a major problem.

SURVEYS OF WATERFOWL BREEDING PAIRS CONDUCTED FROM 1980 TO 1988 by the U.S. Fish and Wildlife Service (USFWS) and the Canadian Wildlife Service have documented record low numbers of mallards, pintails, blue-winged teal, and canvasbacks. This alarming trend prompted the drafting and signing of an agreement between Canada and the United States to deal with the problem.

The North American Waterfowl Management Plan (NAWMP) established management guidelines to protect and enhance wetland and upland habitat over the next 15 years at an estimated cost of $1.5 billion. The plan sets priorities between certain geographic areas of concern, called "joint venture projects." The success of the plan's joint ventures depends on international cooperation between federal governments, state and Provincial agencies, and private organizations and individuals. The plan seeks not only to improve waterfowl populations but also to create long-term protection of the habitat needed to support these populations.

One such cooperative effort of the NAWMP is the U.S. Prairie Pothole Joint Venture, which includes Montana, North and South Dakota, Minnesota, and Iowa (see map). Nearly 15% of the continental duck population originates in this area, once covered by native grasslands and millions of small wetlands. The project seeks to contribute 6.8 million breeding ducks to the continental breeding population, with a fall flight of 13.6 million ducks. An estimated 1.1 million acres of wetland and upland habitat needs to be improved and protected to reach this ambitious goal. A major focus is to work with private landowners and other private citizens to develop both short- and long-term habitat protection. Such agreements will benefit many nongame species as well.

MIKE LOGAN

Record low numbers of mallards and pintails (above) in recent years have led to renewed efforts to address the plight of prairie ducks.

In Montana, the U.S. Prairie Pothole Joint Venture has emphasized two areas for their waterfowl production potential—the Beaver Creek Project in southern Phillips County and the Comertown Project in northeastern Sheridan County. Waterfowl managers representing the USFWS, the Bureau of Land Management (BLM), the Montana Department of Fish, Wildlife and Parks (FW&P), Montana State University, the University of Montana, and The Nature Conservancy identified these two initial areas. Funding is expected from these groups as well as from private sources, including Ducks Unlimited.

KATHRYN MEADE

The U.S. Prairie Pothole Joint Venture seeks to enhance duck production in Montana, the Dakotas, Minnesota, and Iowa by improving and protecting 1.1 million acres of wetland and upland habitat.

The Beaver Creek Project, jointly developed by the BLM, USFWS, and FW&P, proposes to create and restore 3,500 acres of wetland habitat in a 300-square-mile area by improving upland nesting cover, building new stock ponds, and repairing old dams lost during recent floods. About 56% of the land is publicly owned, primarily by the BLM and the Department of State Lands.

If the project successfully creates the additional 3,500 wetland acres, it is expected to attract an additional 15,000 pairs of ducks, assuming water conditions allow aquatic plants and animals to thrive in the basin. Based on previous research here, which indicated a high rate of hen success (40% to 70%), the project could produce 75,000 more ducklings per year. The study attributes Beaver Creek's high waterfowl productivity to the presence of good sagebrush-grassland cover and a scattered wetland base, which reduces nest predation.

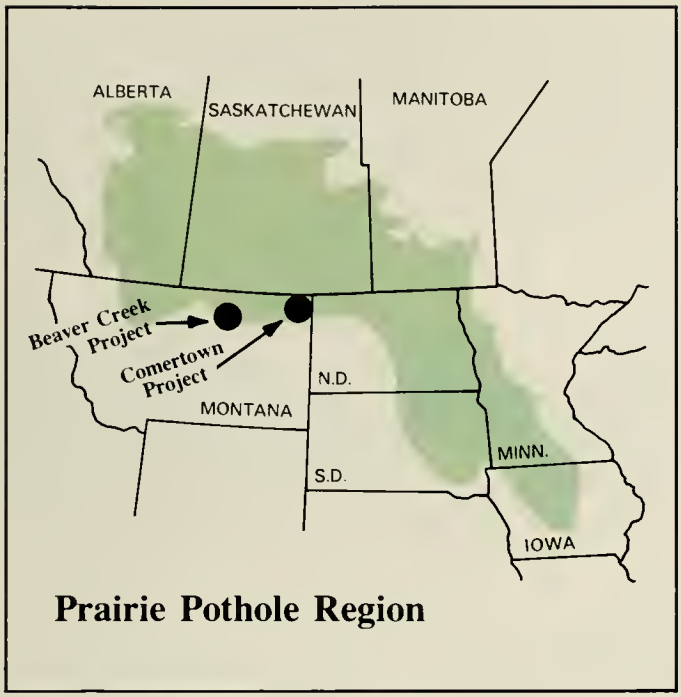
THE BEAVER CREEK PROJECT has faced some controversy. Beaver Creek is a tributary of the Milk River, a river system known for its complex problems of water allocation. The agencies involved in the project recognize the concerns of area landowners and water users. Impounding additional water to produce ducks could conflict with irrigation needs. At the same time, the waterfowl resource faces a serious problem. With conflicting demands in mind, project managers have been meeting with irrigation districts, county commissioners, and individual water users to devise reasonable solutions. The Bureau of Reclamation and the Water Rights Bureau of the Montana Department of Natural Resources and Conservation have participated actively.

Other strategies under consideration in the Beaver Creek Project area include managing grazing, installing water control structures in existing reservoirs, constructing islands and nesting platforms, and planting dense cover on set-aside acres. Some of these developments could improve the landowner's operation and at the same time will conserve soil and water. The joint venture concept will create cooperation that crosses traditional boundaries of private and public land management.

THE SECOND JOINT VENTURE IN MONTANA, the Comertown Project in Sheridan County, approaches its problems somewhat differently. Set in a heavily glaciated prairie pothole region, this area of about 220 square miles contains numerous small lakes and marshes. Upland vegetation is characteristic of the mixed grass and shortgrass prairie. It is 93% privately owned.

Here, breeding pair surveys by the USFWS indicate the highest number of mallard pairs and total breeding ducks of any surveyed area in Montana. Furthermore, nesting studies indicate a 15% to 45% (averaging about 20%) nest success rate, which is higher than that documented in many prairie pothole habitats to the east. The project area also supports many nongame species, and The Nature Conservancy has identified part of it as a preserve for certain rare plants and other unique habitat types.

Since the Comertown area has lost less wetland acreage than



Prairie Pothole Region

most of the midcontinent region, the project will emphasize improving upland habitat disturbed by agriculture. Agricultural disturbances are less intense here than in the rest of the pothole region, reflected in the higher nest success rates; nevertheless, the project must improve the quantity and quality of upland nesting cover to reach its goals—increasing nest success rates to about 50% and increasing the number of juvenile hens returning to nest in subsequent years. Over time, the area has tremendous biological potential to produce ducks.

The cooperators in the Comertown Project—the USFWS, The Nature Conservancy, and FW&P—have taken an innovative approach to funding. The department pledged $50,000 from the state waterfowl stamp program, which was in turn matched with $50,000 from both The Nature Conservancy and the USFWS. The Nature Conservancy then obtained a grant from the National Fish and Wildlife Foundation. Additional money also has been pledged from the USFWS through the Land and Water Conservation Fund. While each agency and each funding source may have slightly different objectives and spending constraints, the cooperative effort should achieve a great deal. Close cooperation will be required among the primary participants and others, including Ducks Unlimited, the Soil Conservation Service (SCS), the Agricultural Stabilization and Conservation Service (ASCS), and the Montana Department of State Lands.

Management of both private and public lands will emphasize five broad strategies: managing grazing, managing predators, planting nesting cover, restoring wetlands and constructing islands, and protecting wetland and upland habitat over the long term through easements, leases, and acquisition. Project supporters recognize that because most of the area is privately owned, management must be acceptable to the landowner and his operation. To that end, contracts have been initiated with landowners, county commissioners, the SCS, and the ASCS.

Successful implementation of the Comertown Project, as well as the U.S. Prairie Pothole Joint Venture and the North American Waterfowl Management Plan, requires innovative approaches to doing business. Montana's successes should benefit joint ventures elsewhere to improve prairie pothole habitat.

Montana's rich tradition of wildlife resources and habitat has long focused on the state's renowned big game species. But waterfowl managers, in-state and out, now recognize the substantial contribution Montana can make to duck and goose populations in both the Pacific and Central flyways. In earlier times, before heavy wetland drainage, Montana's duck production could not measure up to that of the pothole-rich areas farther east, primarily North Dakota and southern Saskatchewan. Today, however, the duck-producing capacity of these traditional areas has diminished; Montana cannot replace that production, but it can contribute significantly to restoring continental duck populations.

The Montana Prairie Pothole Joint Venture projects offer the opportunity to contribute by forging new partnerships. Waterfowl and land managers must seize the opportunity.

TIM LUCAS

Through wetland protection, grazing management, and nesting cover improvement, Montana can contribute significantly to restoration of the nation's duck populations.

Anyone thrilled by the sight of ducks on the wing, sandpipers feeding along a mud flat, or a muskrat paddling through the bulrushes must lend a hand. Support of these projects today is a commitment to the future.

* * * * *

It's early June and the hen mallard's first nest attempt has succeeded. She chose a patch of dense cover, a product of the well-managed grazing system. Now she has moved her brood to the nearby stock pond constructed nearly five years ago by a cooperating landowner. The cattails and bulrushes along its shoreline offer her brood good escape cover, while the aquatic insects and pond weeds provide excellent food. Given favorable weather over the next eight weeks, most of her young will gain flight. Next year, the hen and perhaps two of the juvenile females, each paired with a new drake, will return to this area and continue the cycle. ■

PERSPECTIVES

"Musselshell Magic"

by Wade Fredenberg, illustrated by Randy Bishop

BY HUMAN STANDARDS, *the life span of a river is infinite. Yet a river is a living thing, and its progression from headwaters to eventual confluence with a greater body of water imitates a human life span.*

The headwaters where a river is born are small and fragile but carry all the potential of a newborn baby. As the waters grow and spread, they seek new

adventures, like a reckless but uncoordinated toddler. Similarly, the fish that fin these waters are mostly of the sleek, slender, darting variety. The fragile cutthroat and brilliant brook and rainbow trout are at home here.

As the river directs its waters downstream, adolescence sets in. The pace quickens. The waters become restless and unruly, prone to fits of rage and wild behavior. Within these waters thrive the larger, stronger brown trout; the horizons begin to expand with a greater variety of suckers, minnows, and other species.

Then comes middle age. The river strikes out across the broad fertile valleys, moving to and fro like a metronome. The fish are as varied as freeway traffic and the river seems as though it could follow this routine forever.

Suddenly, with little warning, the river experiences a midlife crisis. Warm or cold? Cold or warm? This is called the transition zone. Trout are out and carp are in. The cold-water species of a youthful stream are replaced by the more highly developed and adaptable warm-water fish. Diversity abounds, but seldom do we humans take the time

to observe and appreciate the changes taking place.

The course is now set, and the river must follow it to old age, shuffling downstream with the scars inflicted by both man and nature. The ponderous, pot-bellied, bewhiskered catfish is the standard-bearer that tells us old age is reality.

Eastern Montana rivers have a "life cycle" like the one just described. From start to finish, top to bottom, the transformation is a natural delight, a bit of magic. Nature has provided a truly staggering array of diversity and adaptation throughout a river system. Join me, if you will, in a fantasy journey down one such stream on the eastern Montana prairie.

* * * * *

I AM THE MUSSELSHELL RIVER, and this is my life story. Pack a big lunch because this journey will take a full year. It just so happens that I'm 364 miles long. If we cover one mile each day, you'll have one day around New Year's to shuttle your car. Jump in!

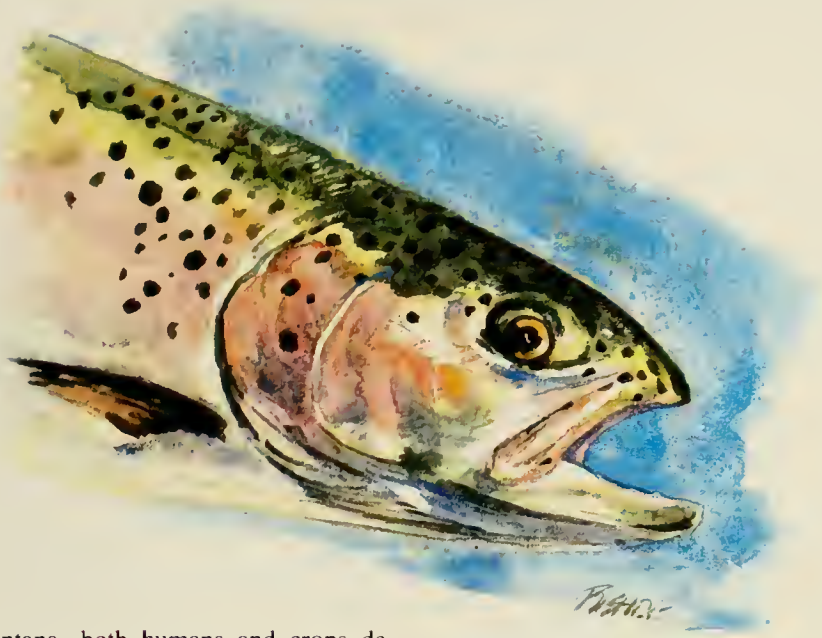
January 1, 1989

In this Centennial year, we started at the junction of my North and South forks. I am reborn every year at the foot of the Crazy, Castle, and Little Belt Mountains in south-central Montana. The waters here are sweet and clear and my flanks are gently finned by schools of darting trout. Insect life abounds on my cobbly bottom. At this time of year, my brushy banks are critical habitat for thousands of mule and white-tailed deer and bird species too numerous to mention. Beavers play stick games as they wait out the winter beneath the ice in pools of their own design.

January and February are spent in quiet contemplation, building up size and sustenance as I gently trickle downstream. I gain strength from the waters of Big Elk Creek and other smaller streams. With spring nearby, an incredible streamside ecosystem is about to be reborn. If rivers ran in circles, this scene would last forever.

February 24

I saw plenty of evidence of human activity as I slid past Harlowton. I crawled under a few bridges and jumped a few minor diversions, but I'm gaining in size and strength and feeling the power of adolescence. As I round a bend near Shawmut, a foreign obstacle rears its ugly head. A concrete lip stretches from bank to bank and my power is diverted into an offstream storage site called Deadman's Basin. The name seems appropriate. In summer, the river might end here, the entire flow diverted only 55 miles from the headwaters. But man has placed a high value on these waters and in eastern



Montana, both humans and crops depend on the precious waters for sustenance. The fishery suffers immensely, but society has determined it is willing to pay the price.

But this is spring—the season of rebirth—and the proverbial chinook winds have caused an early snowmelt. The river swells past the diversion and powers downstream. Man has taken his toll on this river, but the channel-shaping high flows now take their toll on man and his best efforts to contain the Musselshell. Like an unchecked adolescent, the raging river reclaims what was once its own and individual men are relatively powerless against the surging flow.

April 3

It's Easter on the Musselshell and the early-nesting geese are looking for places to hide their eggs. This is a time of renewal, and the willows and cottonwoods are swollen with buds about to burst forth with new life. Our journey has reached the mouth of Careless Creek and once more man has left an ugly reminder of how improper planning can abuse a stream. Some of the water given up at Deadman's Basin nearly 40 miles upstream will be returned at this point. It will trickle in during the next few weeks to supplement irrigation flows. But I gave up cool, clear trout water and now I'm getting back sediment and saline-laden water that would kill any trout that swam in it. At peak runoff I can handle this, but over 30 tons of sediment a day is injected into my system and this means that I've abruptly and prematurely reached the "transition zone."

Middle age has set in. The river meanders downstream past Lavina and Roundup, every bend resembling the one before it, leaving a snake-like track on the landscape. The fishing here leaves a lot to be desired. Oh there are fish—but man has a peculiar way of sorting fish species into two categories and most of this reach of river contains only "rough" fish. The "smooth" fish found upstream are gone for good.

July 4

Today I celebrated Independence Day by leaping another barrier, Delphia Dam. I've lost much of my strength, but the arid uplands surrounding me have prospered from a good soaking. I'm taking on a nice chocolate color now as the silt and sand I transport toward New Orleans hide the buffalo bones and arrowheads of a kinder, gentler era. Whitetail fawns and turkey poults remind me of youth and vigor, but the smallmouth bass and channel catfish that lurk along my undercuts remind me that I've aged. Our journey is half over.

July 20

On a midsummer night, I reach the Musselshell Diversion. My transition zone is now behind me, and I can call myself a full-fledged warm-water

stream if I can just get over this one last dam. Whew—made it! And there to greet me is a school of channel catfish that swam 163 miles up from Fort Peck Reservoir just to spawn in my shifting sandy beds. I'll enjoy the rest of this journey from here on down. I'm retired from the demands of humans. I've slowed down considerably, but fortunately this is a wet year and I'm still vigorous. The last few drought years did me in, and I wasn't able to flow this far. But Centennials have a way of rejuvenating things, and rivers are no exception.

To use a modern term, I've mellowed. With age, both the river and its perspective have broadened. Change is more subtle, but it's also more constant. Diversity is now my lot. Over 30 species of fishes depend on me, from sand shiners to sunfish, from redhorse to goldeye. A warm-water ecosystem is every bit as fascinating as those upstream trout waters if you really give it a chance.

October 5

I received a much-needed transfusion today at the mouth of Flatwillow Creek. From here on down, I don't look much different than I did a few years ago when some fellers named Lewis and Clark were fooling around near here. Cliffs of bentonite cave into me and softshell turtles are burrowing in for a torpid winter's rest.

Of all the seasons, this is the best. Fall creates a certain splendor on my banks. Irrigation season is over, and I don't mind the hunters who crawl across me like field mice to harvest some of my bounty. The more people see of what I've got to offer the better are my chances to continue to flow without being dammed forever.

December 25

It's Christmas, and our destination is near. I didn't used to end like this in Fort Peck Reservoir. I used to saunter into the mighty Missouri and piggyback all the way to New Orleans. But now I'm going to spend the winter with the paddlefish at Fort Peck. The Centennial year of 1989 was a great year for the Musselshell—plenty of water to go around. Next year I'll do it all over again like I've been doing for thousands of years.

Thanks for joining me for a year of magic on the Musselshell. You've got one day left to get back to your car and home for the New Year's celebration. Please, come back again, and bring a friend.■

1988—A Record Elk Harvest

Last year's elk hunting season was unlike any other. Statistically, elk were taken by about one of every three elk hunters for a Montana record harvest of 26,211 animals.

Although reports of Montana's record elk hunting season may surprise some sportsmen, it was anticipated by Department of Fish, Wildlife & Parks biologists. "We opened up the permits to take more elk," said Wildlife Management Bureau Chief Glenn Erickson. "By August of last year, we knew we had high numbers of elk. Due to the drought, we also knew that the vegetation on the winter range was not in very good condition, so we intentionally increased the number of permits in an attempt to reduce populations."

On average, between 17,000 and 18,000 elk are taken annually by Montana sportsmen, who tend to post a success rate of about 17%. During the 1987 season—a season marked by warm, dry conditions that translated into elk staying at the higher elevations they usually inhabit during spring and summer—only 15,000 elk were harvested.

The unusual combination of the high number of elk "carried over" from the mild 1987-88 winter, the drought-related depletion of forage, and the pre-hunting season snowstorms that spurred elk to move early from the mountains to their winter ranges set the stage for Montana's record 1988-89 hunting season.

"It's not unusual to have a mild winter, or drought, or poor forage conditions, or early snowstorms," Erickson explained. "But it is unusual for it all to occur at the same time and to come at a time when we had more elk than ever before—that's just what happened last season."

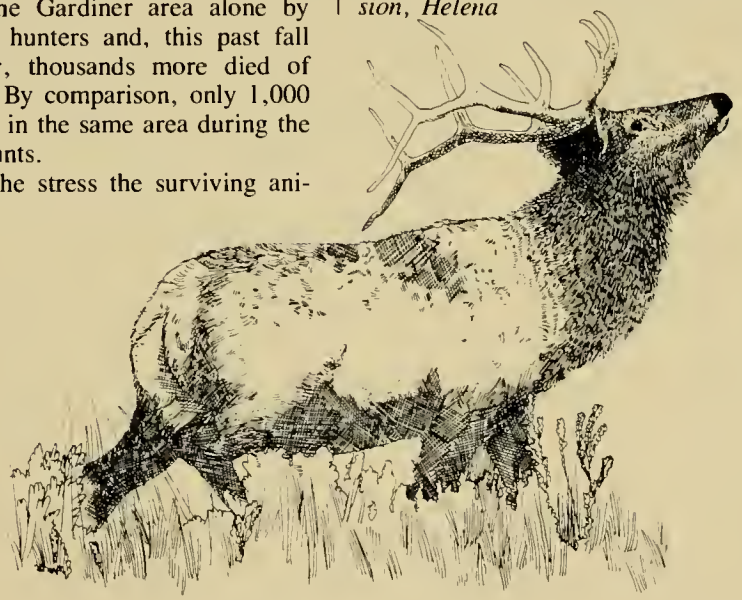
Last season, about 24,000 elk hunting permits were issued to sportsmen through the special drawing. For the upcoming season, Erickson said he suspects the number of permits issued will be closer to the previous five-year average of about 20,000. However, he said there may be some isolated areas where elk numbers on private land should continue to be culled, so a higher than normal number of permits will likely be issued in those areas.

One place where permits are likely to be reduced to allow elk numbers to recover is in the Gardiner area near Yellowstone National Park, where Montana's popular late-season hunt annually takes place. Last season, about 2,700 permits were initially issued for late hunts in Gallatin and Gardiner through Montana's annual special drawing. But about 1,400 more were issued later in the season as hungry, stressed elk from Yellowstone's northern herd left the park in search of food. In all, about 2,300 elk—or about nine percent of the state's total elk harvest—were taken in the Gardiner area alone by late-season hunters and, this past fall and winter, thousands more died of starvation. By comparison, only 1,000 were taken in the same area during the 1987-88 hunts.

Due to the stress the surviving animals experienced last year, biologists suspect this year's elk calf crop in the Yellowstone area will be poor. Accordingly, a reduction in late-season permits will likely be recommended to allow recovery of the segment of Yellowstone's northern elk herd that migrates into Montana.

The well-publicized problems associated with Yellowstone's northern herd last winter are related to a lack of suitable winter habitat for the migrating animals. Through a Memorandum of Understanding among FW&P, the U.S. Forest Service, National Park Service, and the Rocky Mountain Elk Foundation, an effort is under way to acquire additional winter range and secure access to traditional migration corridors of the northern Yellowstone herd. Important habitat has been identified and Governor Stan Stephens and Montana's Congressional delegation are seeking $6 million from the federal government to acquire these lands. FW&P has committed as much as $2 million toward the effort, if federal funds can be obtained.

In general, however, Montana's elk herds are healthy, and they should provide sportsmen with those hunting experiences during the 1989 season that have become the nation's elk-hunting standard.—*Tom Palmer, information officer, Conservation Education Division, Helena*



• *The following article comes from the January 1929 issue (Volume 1, Number 8) issue of* Montana Wild Life. *It was written by Glen A. Smith of the U.S. Forest Service in Missoula, and its title is "The Elk Herds of Montana." We think you'll enjoy comparing and contrasting the numbers it presents with those discussed above.*—Ed.

If you were to ask the average citizen of Montana who is and who is not interested in game matters, where are the big herds of elk, the reply would in all probability, be "Yellowstone, near Gardiner, Montana," or "the Sun River herd." This would be true in part. There are, however, a considerable

number scattered over other portions of the state from the Yellowstone on the east and the state line on the west and along either side of the Continental Divide from the Glacier Park on the north to the state line on the south.

From the best estimates available, elk are found in the following territories and in the following numbers:

Northern Yellowstone—12,000 head (largely summer in the Yellowstone National Park).

Beaverhead National Forest—500 head (mostly in Beaverhead County).

Bitter Root National Forest—580 head (Ravalli County).

Cabinet National Forest—300 head (Sanders County).

Deer Lodge National Forest—1,000 head (Powell, Deer Lodge, Silver Bow, and Jefferson counties).

Flathead National Forest—1,500 head (Flathead and Powell counties).

Gallatin National Forest—300 head, summer; 2,500 to 3,000 drift from the Yellowstone Park and winter on the Gallatin National Forest in Gallatin County.

Helena National Forest—500 head (largely in Broadwater County).

Jefferson National Forest—200 head (largely in Judith Basin County).

Lewis and Clark National Forest—4,200 head (Lewis and Clark and Teton counties).

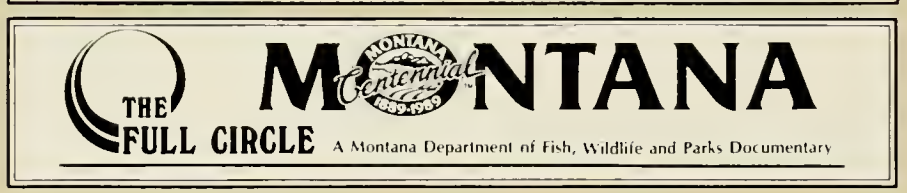
Madison National Forest—400 head (Gallatin and Madison counties).

Lolo National Forest—200 head (Missoula County).

Missoula National Forest—800 head (largely in Powell and Missoula counties).

There are a few additional scattered elk, from 10 to 50 head, in the following counties: Glacier, Pondera, Chouteau, Meagher, Sweet Grass, Stillwater, Granite, Mineral, and Lincoln.

From the foregoing it will be noted that elk are pretty well scattered over a large portion of the western half of Montana with about 11,000 to 12,000 head which summer and winter in Montana and are, therefore, Montana elk. In severe winters there may be as many as 8,000 to 9,000 head drift out of the Yellowstone National Park in Park, Gallatin, and Madison counties. Many of these scattered herds are the result of artificial stocking from the Northern Yellowstone herd or the National Bison Range herd west of Missoula, Montana.



"The Full Circle," a 26-minute Centennial film produced by the Montana Department of Fish, Wildlife & Parks, is now available.

Since wildlife and wild places are so integral to the flow of Montana history and contemporary experience, the film is "essentially the story of a way of life," according to Mike Gurnett, FW&P's film producer. He said the movie explores the efforts of a people to share a life style and an attitude about the world around them which is different in both dramatic and subtle ways from that possessed by society at large. The film celebrates those subtle and dramatic differences. The film tells the story of how the wildlife and wild places of Montana have been preserved, and how these resources have made possible a quality of life both rare and rewarding.

"The Full Circle" is available—free—for screening at meetings, classes, or conventions. It is also for sale in 16 mm ($300), 3/4-inch video ($39.95), or 1/2-inch video ($29.95). To reserve a print or order a copy, contact: Film Center, Department of Fish, Wildlife & Parks, 930 Custer Avenue West; Helena, MT 59620 (406/444-2426).

BOOK REVIEWS

WE MONTANANS, by Norma Tirrell, American Geographic Publishing, P.O. Box 5630, Helena, MT 59604; 1988, 150 pages, $29.95 hard cover, $19.95 soft cover.

Montana naturally lends itself to the talents of professional photographers—so it's no wonder there are many photo books of Montana available. But that other dimension, equally important, is Montana's people...those of us who call Montana home.

On the occasion of her native state's 100th birthday, Norma Tirrell has presented her book, "We Montanans," to that state's citizens. The Helena author visited dozens of Montanans from all walks of life and gathered their stories: where we came from, what brought us here or keeps us here, what is special about life in Montana. Her warm profiles capture the uniqueness of each individual and add up to a composite picture of who we Montanans are.

I myself have harbored ideas of moving, as recently as February '89, when the temperature hovered around 37 degrees below zero and my van sat dead in the parking lot and showed no sign of immediate revival. But where to go? I've nestled in the white sand of the Caribbean you see on postcards, wandered through the maze of rooms in enchanting European castles, sipped tea and munched dim sum in Hong Kong—but I couldn't imagine calling these places home.

Why is that? Perhaps like computers, Montanans are more user-friendly. Those of us under the umbrella of the Big Sky just might be better adjusted than most other folks. Thankfully, there are some significant adjustments we don't have to make—hour-long commutes to work, industrial pollution, and gang wars, to name a few.

The attitudes, feelings, and names and faces of the Montanans Tirrell shares with us will no doubt hit some familiar notes. The foreword by one of Montana's legends, A.B. Guthrie, Jr., and the excellent photographic portraits by Michael Crummett make this a best-seller on my list. As Ed "Moose" Zaidlicz, retired Montana director for the Bureau of Land Management, said: "The fact that you can still get away for two or three days and not see a soul is a privilege you can't disregard....And when you do run into someone in the woods, you never know whether it will be a trapper or a college professor. In some cases, it's both."—*Donita Sexton, art director*

RADICAL ELK HUNTING STRATEGIES: SECRETS OF CALLING ELK IN CLOSE, by Mike Lapinski, Stoneydale Press, 205 Main Street, Stevensville, MT 59870; 1989, 6x9 format, 176 pages, 70 photographs, $17.95 hard cover, $12.95 soft cover.

Any hunting book that begins with a dedication from "The Prophet" by Kahlil Gibran is an instant winner with me: "...since you must kill to eat, and rob the newly born of its mother's milk to quench your thirst, let it be an act of worship," instructs the prophet in this story. "And let your table stand as an altar on which the pure and innocent of the forest and plain are sacrificed for that which is purer and more innocent in man. When you kill a beast, say to him in your heart, 'By the same power that slays you, I too am slain; and I too shall be consumed.' "

Radical stuff. But appropriate for a book titled "Radical Elk Hunting Strategies." Despite the poetic introduction, author and elk hunting authority Mike Lapinski doesn't dwell on the philosophical. He gets right to the physical problem of stalking and taking an elk in rut by first discounting the "perfect bugle theory" that frustrates so many bowhunters. "There is a whole lot more to successful bull elk hunting than simply hitting the right note on a bugle," he says.

In search of a more successful early-season hunt, Lapinski began to study elk behavior in depth. "I began to notice serious discrepancies between the way rutting elk were supposed to react, and the way they actually did during the hunt," he writes. "Bull elk in rut did not react like most hunters were led to believe, and if I was going to be successful hunting them, I had to radically change my hunting technique."

The radical technique involves actually confronting the bull in his own domain rather than trying to lure him toward your bugle. Using the radical strategy, Lapinski has taken most of his elk within 15 yards; the closest one he took was within five yards. Timing—understanding when and how to move in on the bull—is the key to the strategy, he says. His radically improved success rate led him to teach the approach to other hunters and to share it in his book.

Since even a minor miscalculation can ruin an otherwise perfectly executed radical hunt, Lapinski points out common pitfalls. He takes care to distinguish the behavioral differences of immature, mature bachelor, and herd bull elk, and devotes a chapter to the adaptations necessary to hunt each. Here's where his careful study of the elk pays off for the reader.

The reader also will benefit from: Lapinski's expertise on locating bulls, adapting the strategy to rifle hunting, field dressing, selecting proper elk hunting equipment, clothing, and emergency gear; his discussion of the condition of the Western elk herds, and the appendix ranking Western elk hunting state by state. And the reader will enjoy Lapinski's colorful description of the bull elk crazed by the torment of the rut.

Lapinski has contributed articles to many major outdoor publications, including *Outdoor Life*, *Bowhunter*, *Sports Afield*, and *Deer Hunter*, and has written "Western Hunting Guide" and a "Whitetail Deer Hunting" pocket guide, and co-authored "All About Elk" for the North American Hunting Club. "Radical Elk Hunting Strategies" adds another trophy.—*Tara Gallagher, intern*

Wildlife and Wild Country

In celebration of Montana's Centennial, the Montana Wilderness Association (MWA) has produced a colorful commemorative poster, "The Last Best Place." By artist Craig Joslin, it kicks off MWA's Century Poster Series, acclaiming Montana's wildland, wildlife, and heritage.

The Century Poster Series will continue until the turn of the century and will showcase the talents of Montana artists. A limited number of signed copies of "The Last Best Place" are available for $35; unsigned prints are available for $20, including postage. For additional information, contact: Montana Wilderness Association, P.O. Box 635, Helena, MT 59624 (406/443-7350).

CONTRIBUTORS

• The North American Waterfowl Management Plan has established "A Partnership for the Future." Under its management guidelines, wetland and upland waterfowl habitat will be protected and enhanced. It also sets priorities between certain geographic areas of concern, called "joint venture projects." Montana is part of this cooperative effort through the U.S. Prairie Pothole Joint Venture. The plan is to work with private landowners and other citizens to develop both short- and long-term habitat protection for waterfowl. Two project areas have been established in Montana—the Beaver Creek Project in south Phillips County and the Comertown Project in northeastern Sheridan County. Turn to the article by **Jeff Herbert** and **Tom Hinz** on page 2 to realize the importance of Montana's role in restoring continental duck populations. Herbert is the statewide waterfowl coordinator, working from the Wildlife Division headquarters in Helena. Hinz is the Central Flyway coordinator; he works from the department's regional headquarters in Billings.

* * * * *

• Join **Wade Fredenberg** for a year-long trip down the Musselshell. Beginning on page 6, this issue's "Perspectives" is a kind of "year in the life" for this eastern Montana prairie stream. It's a slice of "Musselshell Magic"—a story of darting trout and cobbly bottoms, but also a story of concrete diversions and sediment-laden trickles. Fredenberg, a fishery program specialist with the Department of Fish, Wildlife & Parks in Bozeman, notes he has spent the past six years marveling at the riparian diversity on the Musselshell, and the last three years watching the drought devastate the fishery.

* * * * *

• Few illustrators could do the kind of job **Randy Bishop** did for the Musselshell article. His work has appeared in *American Way*, illustrating Norman Maclean's "A River Runs Through It." His work has also appeared in *Outdoor Life* and *Field & Stream*. Bishop is preparing a poster for the Dallas chapter of Ducks Unlimited which will be issued as a limited edition print. For more information about his work, contact him at 6333 Goliad; Dallas, TX 75214 (214/823-3337).

* * * * *

• We could have called it "Trout and Drought." Instead we called it "The Year of the Big Dry." In any case, it's the story of what 1988's record-low flows mean to Montana's wild trout. As Helena information officer **Tom Palmer** writes, "By early spring, there were warnings that the furies were conspiring to let us have it good." They did. Turn to page 15 to see just how good.

* * * * *

• The title is an appropriate summary of **Ron Spoon's** and **Dennis Workman's** article: "Pushing Forward on the Bitterroot." Beginning on page 18, they trace some of the efforts Bitterroot Valley residents have taken to solve water management problems on this western Montana river. Those concerned faced securing an adequate supply of water, developing a water management plan, and evaluating how effective supplemental water would be in enhancing the river's trout fishery. Workman is the fisheries manager for the Missoula region; Spoon is a fish and wildlife biologist stationed in Philipsburg. The authors would like to acknowledge the efforts of FW&P personnel who pioneered the Bitterroot project—Mark Lere, Pat Graham, and Don Peters. They would also like to thank the many residents of the Bitterroot Valley who were willing to try a new approach in managing the water resources of the Bitterroot drainage.

* * * * *

• **Tara Gallagher** did what not too many interns could do: She stepped in and did a top-notch professional job. The *Montana Outdoors* staff appreciates her contributions to this issue, and we think readers will appreciate her article about "The Digging Machine." She begins her informative badger article with a tantalizing piece of information: "In Blackfeet Indian legend when men and animals were friendly, Badger Chief welcomed White Eagle into his lodge with incense and a chant: 'The earth is sacred. My lodge is sacred. We, the Badgers, are the most powerful of all the animals.' " Gallagher is a graduate student in journalism at the University of Montana. She previously taught high school history and government. Her article about the gruff old codgers with the striped faces begins on page 27.

* * * * *

• We don't believe *MO* has ever published a pictorial book review. If ever a book deserved one, "The Last Best Place" is that book. It's a massive compilation of writing from the journals of explorers, stories from early pioneers, sketches about Butte, remembrances of the agricultural frontier, literature of modern Montana, and contemporary fiction and poetry skillfully and discriminatingly edited by William Kittredge and Annick Smith. We took some quotes from the book to whet your appetite and used them to accompany some wonderful paintings by four Montana artists: **Robert A. Kercher, Jack Hines, Robert F. Morgan**, and **Gary Carter.**

Kercher has been producing his unusual portrayals of wildlife for several years. His versatility in both watercolor and silk screen is evidenced by his continued acceptance in top state and national shows and his numerous awards. He was awarded "People's Choice Best of Show" at the Pacific Rim Wildlife Art Show in Tacoma, Washington, in 1988; in February 1989, he was the subject of a feature article in *Southwest Art Magazine*.

Hines continues his eclectic excellence, holding to his credo that the only limitation he sees in his subject matter is that it must have the imprint of human life. His work ranges from moving depictions of the first inhabitants of the American West to the ancient landscapes of Europe and other parts of the world. He is a noted art teacher and his column, "The Creative Process," continues to be regularly featured in *Southwest Art Magazine*.

Morgan combines a busy and successful career as a full-time artist with much work in behalf of cultural matters in Helena. He recently finished three murals dealing with the Lewis and Clark Expedition for the Montana Historical Society's new formal museum. He also used his talents for dramatizing history and curated a comprehensive show at the Holter Museum of Art, "A Century of Art and Artifacts." He is co-founder of the Northwest Rendezvous of Art.

Carter's interests range from part-time cowboying to fly-fishing, racing hot rods, breeding horses, and art. He paints and sculpts in his studio overlooking Hebgen Lake near West Yellowstone. He is also deeply involved in the work of the Cowboy Artists of America (he was the group's president in 1986) and its museum in Kerrville, Texas. His print company has 34 offerings and offers a new limited edition each quarter to over 700 galleries nationwide.

"The Last Best Place" pictorial book review begins on page 30.

* * * * *

• *MO* thanks the following for their contributions to this issue: photographers **Mike Logan**, Helena; **Tim Lucas**; **Phil Farnes**, Bozeman; **Kathryn Meade**, Great Falls; and **Paul Updike**, Townsend; and these photographers who work for the department: **Mike Aderhold**, Kalispell; **Craig Jourdonnais**, **Mark Lere**, and **Tom Warren**, Helena; **Ron Spoon**, Philipsburg; and **Bill Thomas**, Missoula.■

The Year of the Big Dry by Tom Palmer

RECALLING 1988, THE YEAR OF THE BIG DRY, there were early warnings that the furies were conspiring to let us have it good. By mid-April, the National Weather Service and the Soil Conservation Service had looked toward the sparse to non-existent mountain snowpack and predicted that Montana's summer stream flows would be as low as 50% of normal. This is dry country, so a stream half full is bound to look half empty to even a staunch optimist. Within a fortnight, a small group of farmers in Chester scheduled a 24-hour prayer vigil at Our Savior Lutheran Church. Through the night, people came to the church in half-hour intervals to "humbly ask for rain."

By the end of June the rains still had not come. Most rivers in Montana were flowing at near-record lows. Requests for federal drought-related disaster declarations had already spread to 20 Montana counties.

The early record-low river flows and absence of rain also put Montana's

The nearly dry channel of the Red Rock River on Independence Day was a grim warning of things to come in the long, hot summer of 1988.

photo: TOM WARREN

fishery managers on edge. "My initial reaction was sort of a gut-wrenching thing," said fishery biologist Bruce Rehwinkel, who is based in Townsend near the Missouri River headwaters. "But then I came to the realization that there was not much I could do. It was out of my hands. Me getting an ulcer or high blood pressure wasn't going to put a drop of water in the stream, so the only thing I could do was hope for rain."

The prospect of record-low flows would place Montana's wild trout in an unenviable predicament. For fish, the immediate results of low stream flows are shrunken habitats and reduced food supplies. So, with fewer places to live and fewer things to eat, the ultimate result of low stream flows is fewer fish.

In the Big Hole River, perhaps Montana's most lamented drought-ravaged trout stream, August stream flows near the town of Melrose averaged 88 cubic feet per second (cfs). Flows ranged from a half-mile stretch of virtually dry river bed, to a mere trickle, to 49 cubic feet per second through absolutely prime wild trout country where stream flows average about 700 cfs in good water years. "Last year flows on the Big Hole were one-third of a typical low flow year," said fishery biologist Dick Oswald, who has been monitoring Big Hole fish populations for nine years. "Flows were *extremely* low; I've never seen anything like it." No one else had either. For certain periods of the summer, the lowest flows *ever* recorded in the Big Hole River came in 1988.

The Big Hole is a Jefferson River tributary. With little water coming into the stream at the mouth of the Big Hole, and with water-use demands growing by the day, a 12-mile stretch of the Jefferson was nearly dry in early July and remained virtually dry until September. Some reaches of the 83-mile-long river struggled to maintain trickle flows of four cfs. Rehwinkel said he had never seen such an occurrence in his 11 years of monitoring trout populations on the Jefferson, a stream that typically experiences low flows during the peak of the crop irrigation season.

Portions of the Red Rock River, too, were dry by Independence Day. Across Montana, reservoirs were drawn down to historic low levels and groundwater-fed pothole lakes, in the usually lush and wet Flathead Valley, were going dry before the first day of summer.

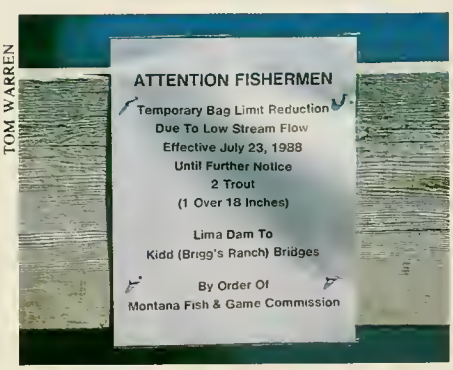
DAVE BOOKS

DAVE BOOKS

Although the Missouri River north of Helena (above) had steady stream flows throughout the drought, the river suffered some losses of young trout due to low water in spawning tributaries. In many streams, trout anglers will see effects of the 1988 drought in two or three years.

The Big Dry was not simply out to drain Montana—it possessed a serious apocalyptic bite. By the first week of the hottest Montana June ever recorded, behemoth C-130 transport planes were lumbering low over Helena to drop their payloads of fire retardant on the Squaw Gulch Fire, which crept within a mile of downtown Helena's historic Last Chance Gulch. Through the hot summer there was the Twodot Fire, the Iron Claims, Lick Creek, Sweetwater, Jim Town, Lulu, Slick, Early Bird, Birthday, Deer Creek, Big Coulee, Squeezer Face, Bainville, Lake Alva, and Whoop-up fires, in addition to the fires in Yellowstone National Park and the massive Canyon Creek and Warm Springs fires.

TOM WARREN



In July 1988, the Montana Fish and Game Commission adopted extensive emergency fishing regulations to protect the adult, spawning-age trout needed to rebuild trout populations.

For months, sunsets were remarkably spectacular and eerily cast before a wood-smoke pall of more than 1,200 fires. Sitting in the bleachers at minor league baseball games on perfectly still summer evenings, there were times when you had to brush away fallen ash from the foam of your cold draft. There was no denying the Big Dry.

NEAR SUMMER'S END, when every Montana county had received federal drought-related disaster declarations, there was no escaping it. On September 6, Montana became a state held hostage by the drought. The threat of fire and lack of water had become so frighteningly severe that the state of Montana

Like the Big Hole River (right), many southwestern Montana rivers experienced record low flows and suffered drought-related fish kills (below).

FW&P PHOTO

FW&P PHOTO

MIKE ADERHOLD

As the water level dropped in northwestern Montana's Hungry Horse Reservoir (left), many trout and kokanee salmon were drawn through power-generating turbines and killed.

was officially closed to all recreational activity outside incorporated cities and towns. A week earlier, at the governor's request, the Montana Fish and Game Commission postponed the opening of the state's early hunting seasons. About three weeks before that order, the commission, faced with dwindling water in many of Montana's drought-ravaged streams and rivers, adopted the most extensive emergency fishing regulations in its history. The emergency regulations reduced the general trout limit in most western and central Montana streams from five to two fish to help sustain the state's heralded wild trout fisheries. The regulations had been in effect on the Big Hole, Jefferson, and Red Rock rivers since July. By the end of August, the commission had adopted similar restrictions on several streams west of the Continental Divide.

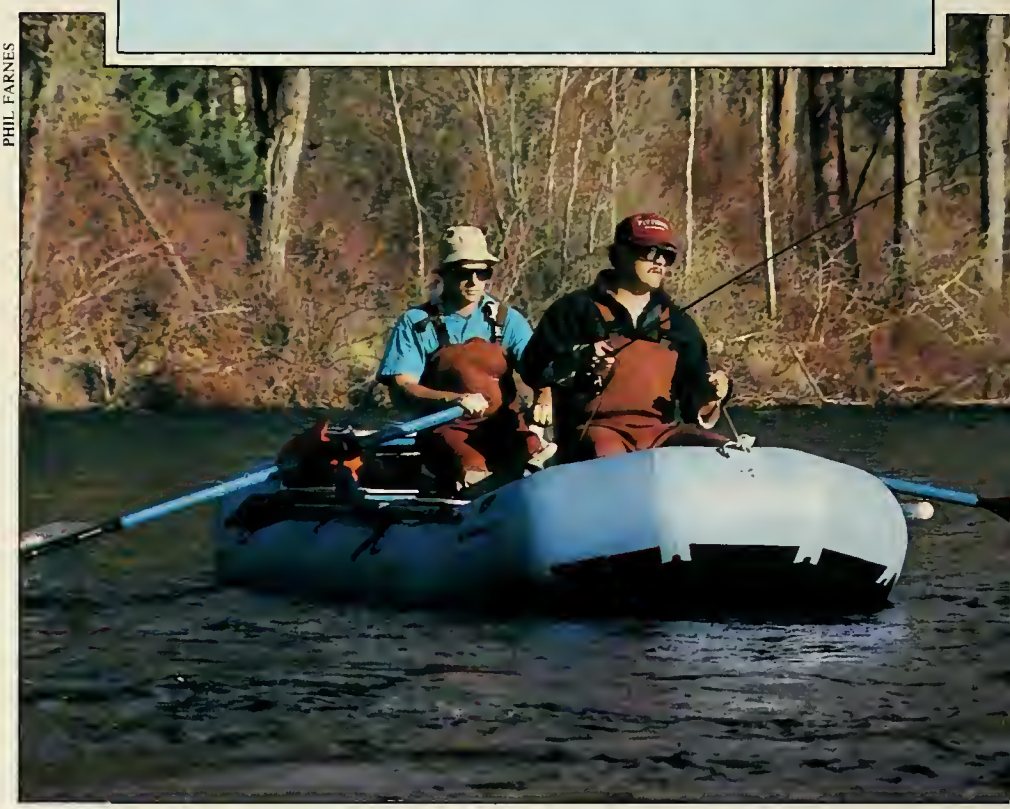
The reduced limits—which remain in effect through February 1990—were adopted to protect adult, spawning-age trout that were becoming increasingly vulnerable to a variety of environmental stresses and angling pressure. Because few rivers in Montana are stocked with hatchery-bred trout, Department of Fish, Wildlife & Parks (FW&P) fishery biologists warned that the remaining adult wild trout in Montana streams would be crucial to the natural rebuilding of trout populations during the fall brown trout spawning season and the following spring's rainbow and cutthroat trout spawning season.

By August, it was painfully clear to biologists and most of the country that the multitude of effects wrought by the drought killed fish as surely as the forest fires burned trees and the relentless sun devastated Montana wheat and barley crops. There were substantial, but impossible to quantify, fish kills on the Jefferson River where spring inventories showed a 24% reduction in spawning-age rainbows. On a 15-mile stretch of the lower Madison River, lethal water temperatures of 80 to 83 degrees killed thousands of whitefish and rainbow and brown trout. On the lower Big Hole River, observed fish kills ranged from 75 to 100 whitefish and five to 10 brown trout per 1,000 feet of river. Fish kills involving brown trout, whitefish, and suckers also were observed in the upper, dry reaches of the Red Rock

continued on page 24

Pushing Forward On The Bitterroot

by Ron Spoon and Dennis Workman



PHIL FARNES

EVERYONE WAS BUSY LAUNCHING RAFTS and slipping canoes into the gin-clear water of the Bitterroot River. It was a typical August day: The air was hot and dry, the sky cloudless. The year was 1981, and David Odell, a consultant for the Bitterroot Water Users Association, had organized a float trip for interested sportsmen, irrigators, landowners, reporters, agency representatives, and elected officials to initiate discussion and thought about the Bitterroot's dewatering problem. Interest in the problem was keen because the snow had disappeared from the rugged Selway-Bitterroot Wilderness, and the water supply had begun to dwindle.

Many interesting sights awaited participants on this trip. They would be able to see bulldozer tracks across the broad expanse of exposed riverbed gravel. Huge gravel dikes would be in place, diverting flows to slake the thirst of the Bitterroot Valley. Floaters would be forced to climb out of their boats and drag or portage them over the exposed gravel bars and shallow riffles. They would see trout stranded in isolated deep pools, waiting for better times.

After the float trip, Odell summed up the day. "Everybody had their eyes opened a little bit," he said. "They didn't realize we had those kinds of problems." Many future meetings would focus on solving the problems. Most proposals recommended taking water from Painted Rocks Reservoir at the head of the drainage. Purchasing the water from the state Department of Natural Resources and Conservation (DNRC) and getting it to the dewatered sections of river, however, presented a whole new set of difficulties.

Constructed in 1938 for irrigation, Painted Rocks is a 32,000-acre reservoir about 40 miles south of Hamilton. In 1958 the Ravalli County Fish and Wildlife Association, the Western Montana Fish and Game Association, and the Montana Fish and Game Department jointly purchased, in perpetuity, 5,000 acre-feet of water from the reservoir to maintain flows in the river during the irrigation season. Purchasers thought this water would keep fish alive when irrigation demand exceeded water supply; to their dismay, it was too little even if it could have slipped past the irrigation headgates. Attempts failed to get the water to the most severely dewatered river section 40 miles downstream. Thus, for many years this 5,000-acre-foot block of water remained in the reservoir.

Interest in solving the dewatering problem, however, remained strong. In 1980, federal legislation helped get the ball rolling. The Pacific Northwest Electric Power Planning and Conservation Act called for rebuilding fish and wildlife populations lost when the Columbia River system was dammed early in this century for low-cost hydroelectric power. Although the law's primary intent was to restore Pacific Coast salmon and steelhead runs to the

PHIL FARNES

Cooperation among sportsmen, irrigators, biologists, and landowners has begun to improve the trout fishery of the Bitterroot River. Water purchased from Painted Rocks Reservoir (above) has helped solve the dewatering problem.

Columbia River, it also included provisions for restoring inland fisheries. Thanks to the efforts of many people, purchase of additional water from Painted Rocks Reservoir became part of the act's Fish and Wildlife Program, which was approved in 1982.

Although the Fish and Wildlife Program stressed long-term funding for the Painted Rocks water purchase, a short-term need remained to buy water until permanent funding became available. In 1984 and 1985, water development funds from DNRC, the Bitterroot Conservation District, and the Department of Fish, Wildlife and Parks (FW&P) enabled the purchase of 10,000 acre-feet of water. Combined with the 5,000 acre-feet purchased earlier, 15,000 acre-feet was available each year. Since 1986, FW&P fishing license dollars have purchased this water. In the future, it will be funded under the auspices of the 1980 Northwest Power Act through a trust fund established by the Montana Power Company. Montana Power became involved in purchasing water for the Bitterroot drainage to help mitigate fisheries losses caused by its hydroelectric facility on the Clark Fork River near Thompson Falls.

Securing an adequate supply of water, however, was only part of the solution to the dewatering problem. Now we had to determine how best to use it to maximize benefits to the river. Consequently, the Bonneville Power Administration funded a four-year study, which FW&P conducted. The objectives were: (1) to determine the feasibility of enhancing Bitterroot River stream flows using water from Painted Rocks Reservoir, (2) to develop a water management plan to structure water releases from the reservoir, and (3) to gather baseline information to evaluate how effective supplemental water releases would be in improving the trout fishery.

STREAM FLOW LEVELS AND TROUT POPULATIONS

No one can argue with the fact that fish in the Bitterroot River need water to survive. Arguments begin, however, when discussing the specifics. For example, how much water is needed to maintain the health of the fishery? How much water should be released from the reservoir, and when? What happens to the fish during low flows? In an attempt to answer these questions, from 1983 to

1986, we monitored stream flows and sampled fish.

To simplify matters, it helps to picture three somewhat distinct trout fisheries on the Bitterroot River. Each reflects the habitat characteristics and the water availability in the respective river segment (see Figure 1). The upper river segment, 20 miles long, extends from the confluence of the East and West forks of the Bitterroot to about five miles upstream from Hamilton. The middle or dewatered segment, which spans the 26 miles from Hamilton to Stevensville, experiences major irrigation withdrawals near Hamilton and return flows near Stevensville. The lower or rewatered segment winds for 34 slow-moving miles between Stevensville and the confluence with the Clark Fork near Missoula. Comparing the fisheries in these three river sections helps to explain the effects of dewatering on Bitterroot River trout populations.

Because the upper segment lies upstream from major irrigation withdrawals, it typically maintains adequate summer stream flows. Thus, it is no coincidence that we observed the highest trout density (1,545 fish per mile) in this area during 1985. Because of its proximity to the reservoir, this reach of river also was most influenced by the supplemental water releases from Painted Rocks beginning in 1983. These releases, accompanied by relatively wet years in 1983 and 1984, significantly increased average summer flows. Rainbow trout populations responded by more than doubling between 1982 and 1985. Most of the increase took place in the younger age classes, especially yearlings. Adult populations remained fairly stable.

In contrast to the relatively healthy fishery in the upper river, the fishery in the dewatered segment showed signs of stress from water depletions. This reach of river has the heaviest irrigation demand and lowest stream flow levels. Although brown trout densities were similar in the two sections, rainbow trout declined significantly in the dewatered stretch (Figure 1).

As in the upper river, the density of juvenile fish appeared most influenced by stream flow levels. Numbers of juvenile fish increased following the good water years of 1983 and 1984, but decreased during the extreme drought in 1985. Adult trout numbers also increased following the good water years, but surprisingly showed only minor decreases after the extreme low flows during 1985.

Adult fish surviving these conditions owe their existence to groundwater inflows. Empty spaces between the gravels in the Bitterroot Valley floor contain vast quantities of water. When surface waters are depleted, this reservoir of stored water helps prevent the river from becoming completely dewatered. Although nearly all streams receive groundwater during the summer, the dewatered segment of the Bitterroot has unusually high inflow rates.

When flows merely trickle, as in 1985, this cool groundwater feeds the deep pools scoured during spring runoff. Although such pools are not ideal trout habitat, adult trout can survive brief periods in them. Juvenile trout, however, don't fare as well. These small fish (one to three inches long) depend on brushy or rocky shoreline for protection during their first year or two

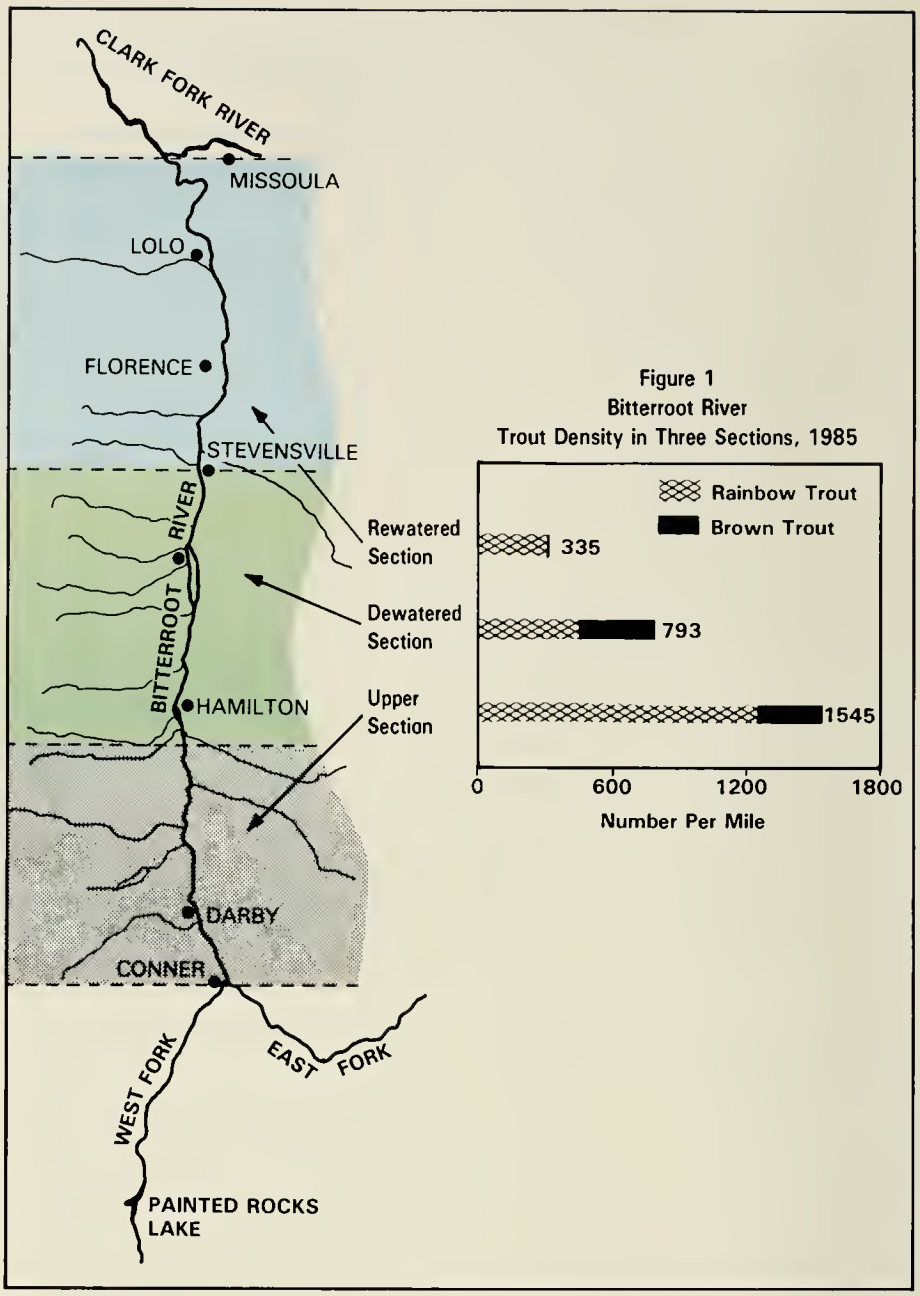


Figure 1
Bitterroot River
Trout Density in Three Sections, 1985

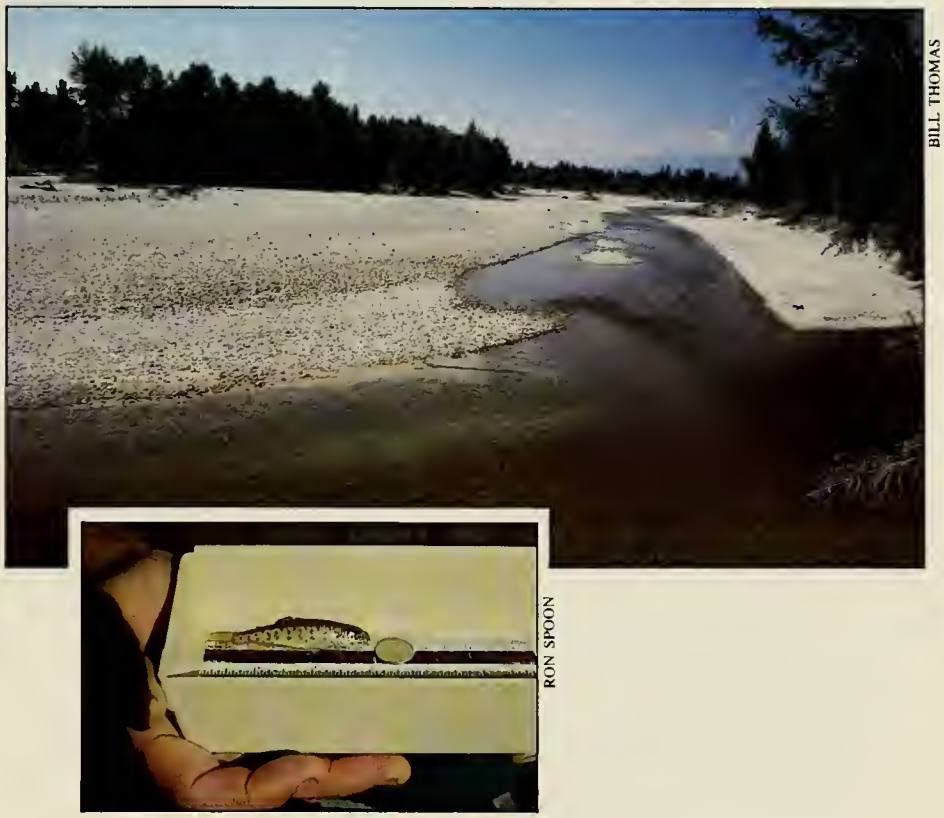
of life, and when shoreline habitat is exposed during low water, juveniles must either migrate (increasing exposure to predation), enter irrigation canals, or move into pools where adults are concentrated (also increasing exposure to a variety of predators).

This process is relatively subtle, and large numbers of fish may be lost with few outward signs of mortality. Because there is a lag before the angler notices the effects of high juvenile trout mortality, its significance is often overlooked: Many fishermen seem to take small fish for granted, and may even consider them a nuisance in their quest for larger fish. Biologists, on the other hand, consider small fish the backbone of the fishery. Without healthy production and survival of juveniles, a viable wild trout fishery cannot be maintained.

In contrast to the upper river, the dewatered segment does not receive enough supplemental water released from Painted Rocks to help increase trout populations. In this section, water is most needed—and least often delivered—when flows are low and irrigation demand is high. Ditch managers try to cooperate to get this water downstream, but the complexity and inefficiency of the irrigation system frustrates their efforts. For example, in 1986 the major canals reduced withdrawals to allow reservoir releases to pass downstream, but much of the water failed to reach the target because several small ditches without headgates couldn't adequately prevent its diversion.

If experience in the Bitterroot has taught us one thing, it is that water storage alone will not solve the dewatering problem. During 1985, the first drought year of the evaluation period, water released from Painted Rocks Reservoir provided few benefits to the dewatered segment of the river—only 10% of the water flowing in the upper river (near Darby) reached the dewatered section during extreme low flows.

Because of the problems in 1985, irrigators and FW&P personnel agreed to two things before the 1986 irrigation season: a water exchange and the appointment of a water commissioner by the district court. These measures significantly improved stream flow in



BILL THOMAS

RON SPOON

The middle section of the river (above), between Hamilton and Stevensville, has the heaviest irrigation demand and hence the lowest summer flows. Juvenile fish, because they depend on brushy or rocky shoreline for protection, are hardest hit by stream dewatering.

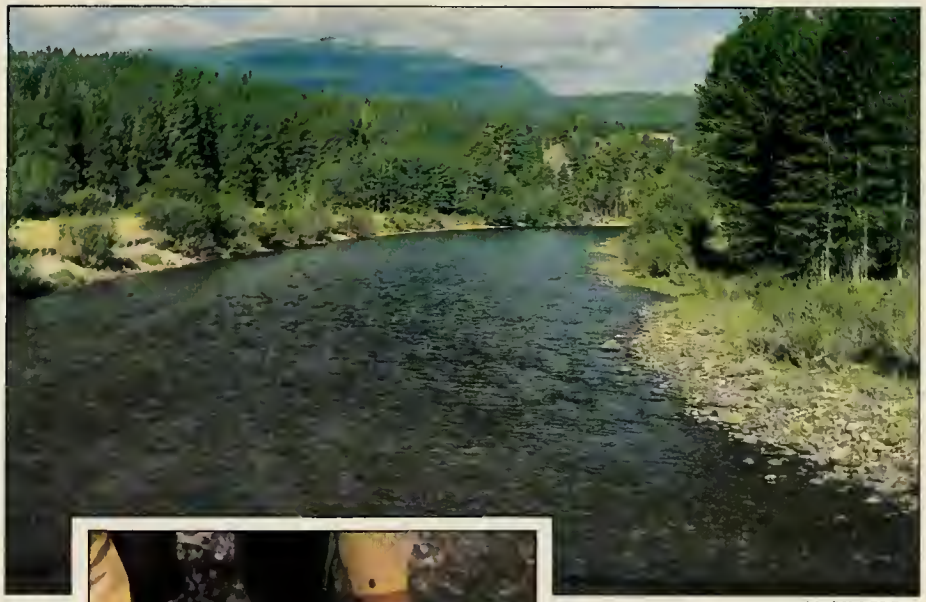
the dewatered segment in 1986, 1987, and 1988. During extremely low flows in these years, an average of 32% of the water available in the upper river reached the dewatered segment—considerably more than the 10% before the agreement.

In addition to fish mortality caused by chronic dewatering, the Bitterroot loses a significant number of fish to irrigation canals in the dewatered segment. Almost all of the major ditches contain trout that would otherwise reside in the river. Ditch shutdown in the fall strands large numbers of fish, significantly harming the fishery.

Fisheries biologists are exploring ways to reduce the number of fish lost to ditches. The obvious solution—preventing fish from entering them—is not always desirable, since ditches sometimes contain the only available water. During extremely low flows, it may be beneficial to allow fish to enter and reside in a ditch, provided a way exists to return fish to the river at the end of the irrigation season when stream flows have improved. With proper headgate design and a means for containing fish in the upper segment of the canal, shutting down the ditch in increments could effectively allow fish to return to the river.

Somewhat surprisingly, our information did not show improved trout populations in the rewatered segment of the river below Stevensville, even though irrigation returns replenish stream flows there. In fact, we observed fewer trout in this section than in the dewatered reach. How can this be? We believe the answer relates to spawning habitat.

Bitterroot River trout prefer to spawn in tributary streams with clean gravel bottoms. Rainbow trout spawn in these tributaries in early spring, and the fertilized eggs, buried within the gravel, hatch during late May or early June. Trout fry emerge from the gravel during mid-June and begin to migrate to the river to take up residence. Because such tributaries are rare in the lower Bitter-



MARK LERE

MARK LERE

The upper segment of the Bitterroot (left), lies upstream from major irrigation withdrawals and typically maintains adequate summer stream flows. This section of stream has a viable population of cutthroat trout, in addition to browns and rainbows.

root River, spawners—and juvenile trout—have to make a long and precarious journey.

Based on recovery of tagged rainbow trout, we learned that fish residing in the lower river tend to travel many miles upstream to the dewatered section to enter spawning tributaries there. It surprises many people to learn that these tributaries, which are dry during much of the summer, can be valuable sources for recruitment of young fish to the Bitterroot River. Reproductive success is largely a matter of timing, and perhaps a little luck. During good water years, flows are relatively high during the migration period, and the transition from tributary residence to river residence goes smoothly. But poor water years present a different story.

For example, 1986 had meager snowpack, and spring runoff was nearly over when fry began their downstream migration. Because migrating fry tend to travel in the main thread of current en route to the river, they often unwittingly enter irrigation ditches when water is low and irrigation demand is high. We observed an 80% loss of migrating trout fry in one tributary during peak migration. Fry may also perish if sections of stream dry up before their emergence from the gravel is completed. Even if fry manage to reach the river, they may find nowhere to live if low flows leave preferred shoreline habitat high and dry.

Thus, although the lower river does not experience severe dewatering, its trout populations suffer from the dewatering in other segments of the river. Efforts to improve stream flow in the dewatered section can benefit the fishery of the lower river by improving conditions in the major spawning tributaries.

WHAT DOES THE FUTURE HOLD?

Cooperative efforts have begun to improve the trout fishery of the Bitterroot River. The various water users in the valley are communicating and have become accustomed to working together; a river commissioner works with fishery and agricultural interests in dry years to see that both get a share of the water, and a trust fund has been established to buy a portion of Painted Rocks Reservoir water for instream flow.

Nonetheless, most of the river's fishery remains below its potential. We must continue to look for innovative solutions to problems of dewatering, fish mortality in ditches, and streambed disturbance caused by construction of gravel dikes for irrigation diversions.

The greatest potential for improving the Bitterroot fishery lies in increasing the summer stream flow. Supplemental water released from Painted Rocks Reservoir has done much in the upper river, and the fishery has responded positively. We expect continued work with irrigators to bring progressively improved flows in the dewatered segment. Preventing fish from entering irrigation ditches or returning them safely to the river after they have entered could significantly improve trout populations. Structures are being developed that will facilitate this, but they may be expensive to build and maintain. Another development that will benefit the fishery is an alternative method of irrigation diversion—a portable metal structure designed to replace gravel dikes. It will help reduce streambed disturbances caused by dike construction and should also help conserve water by allowing better regulation of withdrawals.

We have made progress since that hot August day in 1981 when David Odell launched his flotilla on the Bitterroot. Efforts during the past few years have paid handsome dividends, and concerned parties are eager to push forward. Water users in the Bitterroot Valley are working together to secure long-term, local control over the unallocated water in the reservoir. By taking an active interest in water management, residents of the Bitterroot Valley have come one step closer to resolving conflicts over use of their most valuable resource. ■

READERS RESPOND

If You Can't Drag It—Get a Wheelbarrow

Sheryl Wisener

This picture is of Sheryl Wisener of Eureka, Montana. She and her husband Jim went out hunting one morning, they parked their pickup, and each took off in a different direction.

Sheryl hadn't gone far when she saw a three-point mule buck. She downed the animal with a clean shot to the head, dressed it out (she's been cleaning her own game since she was a young girl—her dad taught her), and dragged it about half a mile. She is only four feet, 11 inches tall, so she knew she couldn't pack the animal out by herself. So she went back to her pickup and went home to get the wheelbarrow. She was coming down the road with the deer loaded when her husband Jim snapped this picture.

I think it's a classic, hooray for women hunters.—*Donna H. Peter; Eureka, Montana*

Salute to Montana

We lived in Montana from fall of 1987 to fall of 1988. For personal reasons, we moved back East. But we love the West, Montana in particular, especially northwest of the divide (the North Fork) which we called home for a year.

It was a wondrous and magical year, taking in all four seasons. I, who had never even read a poem, was inspired to write them. I would like very much for you to publish this selection in your magazine, as a salute to Montana on her 100th birthday.

Our love for the place we had and the surrounding area—known as "Out West"—will never be forgotten.—*Dorothy Richardson; Oakland, Maine*

The Summer of '88

It's so hot
I care not
Of what to do
Or what to eat;
Just call me beat
In this heat.

Some rain to stain
The dust that flies,
Some clouds and cool that dries
The sweat and satisfied;

My desire for change
In the weather
Is plain to see,
As I sit beneath a leaf
Hoping for relief.

Before I despair
And do not care,

Let the rain flow
With winds that blow!
Now I want you to know
That heat can beat and sap you dry
Of energy and spirit.

So let's hear it
For wind and rain
And Hurricanes.

* * * * *

• *For another look at "The Year of the Big Dry" and what it meant for trout, turn to Tom Palmer's article on page 15.*—Ed.

Group Offers Raptor Tape

The Golden Gate Raptor Observatory (GGRO) in San Francisco offers a program of study, conservation, and education built around the migration of more than 10,000 birds of prey through the Marin Headlands each fall. The GGRO is producing a video describing raptor handling and banding techniques. We thought some of your readers might be interested in seeing it because it will be useful to anyone involved in raptor handling and banding.

Needless to say, improper handling can be dangerous and stressful for the birds. We would like to show a consistent method of handling the raptors while taking accurate information such as weight and measurements. The tape will show the methods we use during our banding process.

We are trying to locate other groups and individuals who could benefit from viewing this tape. Like the GGRO, many organizations incorporate volunteers, and it is not always practical to teach people the basics using live birds.—*Sheryl Stucky, Golden Gate Raptor Observatory, Fort Mason, Building 201, Third Floor; San Francisco, California 94123.*

Can't Wait!

I just received my first copy of *Montana Outdoors*. I have read it from cover to cover. The features and departments are great! I can't wait for the next issue, so I am ordering the back issues for the first five issues of 1988 and for the entire years of 1987 and 1986.—*Robert W. Shobe; Austin, Texas*

Stunning Testimony

In our federal offices, specifically in our environmental branch, the outdoor magazines of several states circulate through our in-baskets. Being Montana born and raised, I favor your magazine. But even if I were not, I would have to say yours is the best. And even my co-workers, defensive of their own native states, have come to agree that *Montana Outdoors* has the most impressive photography and wildlife coverage.

Your latest Special Photo Issue, especially, offers stunning testimony to the beauty of Montana and to the skill of your contributors and your staff. You are blessed with photos that professional offerings do not surpass.—*Steve Rothe; Omaha, Nebraska*

The Year of the Big Dry

continued from page 17

River, downstream from Lima Reservoir, which had been virtually drained for untimely repairs. As water levels dropped in northwestern Montana's Hungry Horse Reservoir and Lake Koocanusa, trout and kokanee salmon became more concentrated and many were killed when they were drawn through the dam's electric power-generating turbines. There were untold, but less dramatic, fish kills in other areas of the state where streams, lakes, reservoirs, and ponds fell victim to the Big Dry.

The drought forced deep, frigid water releases from Yellowtail Dam to maintain Bighorn River flows. The ice-cold water did not kill trout, but it stunted the growth rates of brown trout for several miles downstream. On the Beaverhead River, which held up well over the hot summer, adult rainbow trout populations were significantly reduced over the winter when releases from Clark Canyon Dam were drastically cut to allow the reservoir to refill.

This summer, however, after a fine and wet fall, winter, and spring that brought near-normal levels of precipitation to almost every corner of Montana, fishing appeared to be better than expected. On the Madison River (thanks largely to the Montana Power Company's auspicious water releases from Hebgen Reservoir), biologists found record numbers of large fish and above average trout populations on a six-mile reach of the lower river near the West Fork.

THIS IS, AFTER ALL, MONTANA—a state possessing unique world-class trout fishing opportunities valued at $215 million a year. Even in the Big Hole—where brown trout numbers near Melrose topped 1,400 brown trout per mile in the spring of 1985 and where those numbers had plummeted nearly 40% in 1989—there were still 873 brown trout per mile this spring. Although 873 brown trout per mile seems abundant, it remains a distressing statistic because it is far fewer fish than the river is capable of supporting. Lack of water is the culprit.

Still, anglers have been catching trout on portions of both the Jefferson and Red Rock rivers. The Big Hole, too, has offered up colorful trout, but it benefited from emergency catch and release regulations for the final three weeks of September and was closed to all trout fishing on October 1, two months ahead of schedule.

Anglers this year have even caught brown trout on the Musselshell River, a stream that would have struggled to support a cactus last summer (see Wade Fredenberg's article, "Musselshell Magic," on page 6 of this issue). "The fish in the Stillwater, Boulder, and Musselshell rivers fared better than we expected," said FW&P's Jim Darling. Darling, who is based in Billings, manages Montana's south-central fisheries resource, which includes the renowned Yellowstone and Bighorn rivers. "I don't know if brown trout are part lung-fish or what, but we're finding them in the Musselshell. I'm just totally amazed that any at all turned up."

> **"Something to keep in mind is if we had two or three years in a row like we had last year, we might have had a fishery that was hit hard, hard, hard on the head. What we have now is a weak age-class."**
> *Steve Leathe, Regional Fisheries Manager, Great Falls*

Unfortunately, that is not to say that the Big Dry's shroud has been lifted off the state's wild trout resource. "Something to keep in mind," offered Great Falls-based fisheries manager Steve Leathe, "is if we had two or three years in a row like we had last year, we might have had a fishery that was hit hard, hard, hard on the head. What we have now is a weak age-class." In other words, the Big Dry had the power to knock down the state's world-class wild trout fisheries, but it lacked the endurance to knock them out.

SOME OF THE MOST IMPORTANT INFORMATION concerning the effect of the 1988 drought on trout populations won't be gathered until fall, when trout populations are typically highest. Yet many FW&P fishery biologists are already predicting that they will find reductions in the "standing crop" of young fish, primarily because data from fall '88 and spring '89 inventories have turned up a worrisome trend in some of the state's finest trout streams.

Early reports have revealed that in the Big Hole, Jefferson, and Missouri rivers, and in Rock Creek near Missoula, the youngest trout in the populations—1 and 2-year-old fish up to 11 inches long—may have experienced significant reductions. Oswald estimates that the Big Hole lost from 52% to 60% of the yearling brown trout in the river's top spawning and rearing sections near the towns of Melrose and Glen. Yearling losses of the Big Hole's rainbow trout have run as high as 84%. When those losses are combined with the poor spawning conditions that prevailed during the spring and fall of 1988, Oswald said there eventually will be a conspicuous "hole" in the Big Hole's trout populations.

"Last year's reproduction is going to be extremely weak, but we won't see those yearlings until this fall, so there's no telling how weak it's going to be," Oswald said. "But, we know we're going to have two years, back-to-back, of poor recruitment in the population. In two to three years, fishermen are going to see a related decline in the bigger fish they catch."

The trout anglers catch in southwestern Montana are generally at least 12 inches long, or at least 3 years old. The

trout age-classes expected to be the most severely affected by the low flows that plagued Montana's rivers in 1988 won't reach 3 years of age until 1990 and 1991.

On Rock Creek, a stream that has experienced low stream flows for the past four years, loss of young rainbows at long-time monitoring sections range from 47% to 92%. Similar drought-related young rainbow trout population declines have been observed in the Bitterroot and Blackfoot rivers. Even on the Missouri River, an excellent tail-water fishery that had steady stream flows throughout the drought (thanks again to cooperative water-release agreements with the Bureau of Reclamation at Canyon Ferry Dam and the Montana Power Company at Hauser and Holter dams), the river will suffer some young rainbow trout losses.

The Missouri River losses will likely be associated with low flows in Little Prickly Pear Creek, the Dearborn River, and Sheep Creek, three of the Missouri's most important spawning and rearing tributaries. Each spring some 20,000 rainbow trout spawn in Little Prickly Pear Creek. The creek provides one-third of all the rainbow trout found along nearly 35 miles of the blue ribbon Missouri downstream from Holter Dam. Extremely low flows in the critical Little Prickly Pear Creek, Dearborn River, and Sheep Creek left most spawning redds high and dry and forced young fish out to the main river where they had difficulty competing for food and shelter—and where they likely became food for larger fish.

Losses associated with dry spawning areas also are possible on the Bighorn River, where some spawning and rearing side channels went dry. The glorious Yellowstone River, too, may bear yearling trout losses associated with low flows in its mid-reach tributaries.

Because of these losses, during the summers of '90 and '91, it's possible that some anglers may fish longer and work harder to catch fewer larger-sized trout. "We'll go into those years with a weak age-class," Fishery Management Bureau Chief Steve McMullin said, "but we're hoping for higher survival and growth rates of those fish from here on out because we know there will not be as much competition for food and space and there will be less predation on the fish as they grow. If we have normal or near-normal conditions for the next few years I think we'll see that wild fish populations are pretty resilient. If we have two or three years in a row of drought and extremely low stream flows, that can really damage a wild trout fishery."

"We have problems here and they're obvious ones for the fishery, but there's hope. The water leasing bill is a step in the right direction and last summer we had irrigators asking how to shut their headgates down to save fish. People are learning and they're acknowledging that there is a problem and that's good."
—Bruce Rehwinkel, Fisheries Biologist, Townsend

IT WAS A BAD YEAR, THE BIG DRY. Two or three years of the same would have been too tragic for words. In 1988 streams were low. Streams were dry. Fish were dead. Wells were dry. Barley fields were parched and nearly 70% of the crop never made it to market. Hay production dropped below 3 million tons and it reached a Montana record price of $100 a ton. At those prices, when you feel your heart begin to break, sometimes it's best just to sell some of your livestock and try to keep your composure.

People got angry last year. They pointed fingers and laid blame. When anglers watched some reaches of their favorite streams go dry, much of the blame was laid at the irrigation headgates of Montana farmers, whose right to use the water dates back some 100 years. Mark Twain was right, after all. When God created the American West, He did provide plenty of whiskey for commiseration and just enough water to fight over. But last year, through all the dust and hard words, it was hard to see who was wearing the black hats. Listen to William Kittredge, writing in the Winter 1986 issue of *Montana: The Magazine of Western History*:

> By the time I was old enough to run the farming we had miles of canals and hundreds of redwood headgates, 18-inch electric pumps—the works. The most intricate part of my job was called 'balancing water,' a night-and-day process of opening and closing pipes and running pumps. That system was the finest and most intricate plaything I ever had.
>
> Despite the mud and endless hours, the work remained play for a long time, the perfecting of that irrigation system a kind of artistry, the making of a thing both functional and elegant. That's how we thought of it; we were bringing order to the world, doing God's work and creating a good place on earth, living the pastoral yeoman dream. Our work surely earned us the right to absolute control over the thing we had created.

Ironically, in the summer of 1988, the only steady stream of water in some areas was found in irrigation ditches. As in past years, many trout sought refuge there and were certain to die there once the water diversions were shut down. FW&P fisheries biologist Brad Shepard, however, pressed the state to publicize a little-known study that showed that when irrigation headgates are gradually, rather than abruptly, shut down at the end of the season, most trout will safely migrate out of the ditch and back to the stream. By August 1, the information was published in most

Montana newspapers and relayed directly to many irrigators. At the end of the irrigation season, many farmers and ranchers throughout Montana tried the gradual shut-down method and their efforts undoubtedly returned hundreds of spawning-age trout—that would otherwise have been trapped in the ditches—to their native rivers and streams.

Perhaps because returning wild trout to their native streams was such a pure and simple act, it acquired a sense of righteousness and compassion—Kittredge's pastoral yeoman, returning what rightfully belongs to the river.

In Montana's Centennial Legislature, however, the political solutions spurred by the drought rocked between righteousness and indignation. In a sense, it was a battle between the pastoral yeoman, who felt the necessity to defend his work against what Kittredge called the "needs of society," which were advanced by many conservationists and Montana's Governor Stan Stephens.

WHEN THE DUST SETTLED, after several fits and starts, two important drought-related bills were cautiously passed by the Montana Legislature to help ameliorate Montana's water allocation quandary. House Bill 707 asks FW&P and the Department of Natural Resources and Conservation (DNRC) to study the feasibility of leasing existing water rights to maintain and enhance stream flows for fisheries. Under the bill, up to five stream reaches can be selected for a four-year pilot program that allows FW&P to lease water rights from willing individuals and groups.

In theory, the bill will help Montana's fisheries by allowing FW&P—and only FW&P—to lease water to maintain sufficient in-stream flows for fisheries to remain healthy and productive. The owners of the water rights will also benefit because, for the first time, they will be able to realize a new financial return on these rights. Previous Montana law did not allow a water right to be sold or leased for in-stream uses.

A second bill, House Bill 463, allows district courts to appoint a water mediator to help resolve a water controversy in some areas and it establishes an education program for water commissioners and mediators.

"The fact of the matter is, we're living in the semi-arid West and we're never going to have copious quantities of water," said Richard Brasch, an official with the DNRC's Water Management Bureau. "Given all the different demands for water in Montana—irrigation, fisheries, recreation, municipalities—it's easy to see that there are a lot of competing demands. That's why long-term and basinwide management activities are going to be so important and that's why the water leasing bill is being looked at as very important legislation. It's a small step in the right direction."

Fishery biologist Rehwinkel, for one, agrees. "We have problems here and they're obvious ones for the fishery, but there's hope. The water leasing bill is a step in the right direction and last summer we had irrigators asking how to shut their headgates down to save fish. People are learning and they're acknowledging that there is a problem and that's good."

There is a fear, however, that what is gone will soon be forgotten. Even with the near-normal snow in the mountains and a cool spring that brought intermittent rains, most Montana river flows will be *below* normal this summer. The reasons are many: The dry soil has soaked up water that was expected to reach the rivers; aquifers are being refilled and many reservoirs, drawn down so low last summer, won't refill this year, which will force a cutback in water releases. For Montana's streams and rivers, and the wild trout they hold, the Big Dry endures.

"One of the worst mistakes we can make right now, when water flows appear to be good, is to put these problems out of sight and out of mind," Brasch offered. "We are hoping the outcome of the problems of last summer will let us all sit down and figure out what we can do and who should do it."

That, in the end, will be the legacy of the Big Dry. The effects of the drought on Montana's trout populations will be reflected by how the drought affected the way we all think about water, what we have learned, and what we have done about it.

Jerome Namis, a founding father of long-range weather forecasting wrote in the April 1989 issue of *Weatherwise*, "Many empirical studies conducted since the turn of the century have proven that drought is never due to a single cause, but always to multiple causes often synergistic in character."

The solutions to Montana's water allocation problems are as complex as the natural elements that work together to cause drought. Of course, there is a major difference. The natural elements that worked together brought disaster to Montana. The people of Montana have a chance to work together to set things right.■

EXPERIENCE THE OUTDOORS: CELEBRATE

National Hunting & Fishing Day Sept. 23, 1989

CRAIG JOURDONNAIS

The Digging Machine

by Tara Gallagher

IN BLACKFEET INDIAN LEGEND WHEN MEN AND ANIMALS WERE FRIENDLY, Badger Chief welcomed White Eagle into his lodge with incense and a chant: "The earth is sacred. My lodge is sacred. We, the Badgers, are the most powerful of all the animals."

Badger and other sacred powers and spirits, like Thunder and the Medicine Grizzly, inhabited traditional Blackfeet country. Wedged between Glacier National Park and the Bob Marshall Wilderness, today the country is called the Badger-Two Medicine. Thunder kept the medicine pipe, the greatest power known to the Blackfeet. In the presence of the pipe, the Blackfeet guarded against uttering the word "bear," lest an evil power enshroud the pipe. Instead, they substituted the word "badger." Perhaps this buttressed Badger Chief's grandiose claims.

And perhaps Badger Chief exaggerated his physical power by comparing it with Medicine Grizzly, the most physically powerful of animals, but "striped-face," as he was known, possessed his own great strength and spiritual powers.*

ANYONE WHO HAS OBSERVED BADGERS in the wild can draw other connections, outside of legend, between badger and bear. Department of Fish, Wildlife & Parks (FW&P) nongame biologist Dennis Flath recalls spotting an especially large boar badger, which he pursued on foot to photograph. "He was just trouncing away across the prairie," Flath says, when the boar crossed a small hummock of an old den and stopped for protection. Flath was certain he had lost the boar to the underground tunnel behind the mound. But instead of retreating as Flath approached, the crouching prairie mammal pulled his front feet together, arched his back into a frightful hump, fluffed and bristled his salt-and-pepper coat, and lowered his head.

"All of a sudden some kind of a monster sticks its head out of the ground," Flath recalls. "When he bowed his back like that and put his head to the ground, his body took on the appearance of the head of a grizzly." The distinctive facial markings on the lowered head looked like a set of eyes, adding to the effect, Flath says. "It stopped me short—so short that I forgot to take the picture."

** As recounted by Dr. Jay Hansford C. Vest, Blackfeet Community College, Browning, in "The Badger-Two Medicine Wildlands: Sacred Geography of the Blackfeet" and "Traditional Blackfeet Religion and the Sacred Badger-Two Medicine Wildlands." The author also credits George Kipp, Blackfeet traditionalist, Blackfeet Community College, for interpretations of Blackfeet tradition.*

Perhaps over the centuries, the badger adopted such a defensive display to emulate the grizzly—once a plains animal—because of its survival value, Flath speculates.

When alarmed, the badger also has been known to burrow itself out of view in a matter of minutes, its muscular legs able to upturn and discard large amounts of soil and turf even in tight quarters. Dr. Steve Minta, an authority on badgers who spent three and one-half years researching their ecology and behavior in the National Elk Refuge at Jackson Hole, Wyoming, confirms that, if attacked, "the badger would first do anything it could to retreat," but it is a "notoriously vicious defender."

Although the badger displays the ferocity of the bear, its dour personality may be more notorious. Kathy Minta, who observed badger natal dens while a co-researcher at the elk refuge, says the badger is more than a sourpuss. A faithful badger watcher will witness another personality trait—playfulness, including a hankering for sunbathing.

And Steve Minta, now a faculty affiliate with the University of Montana Division of Biological Sciences, insists that badgers' reputation as "gruff old codgers" must be placed into perspective because their cantankerous disposition has contributed to successful adaptation through a long evolutionary history.

"They're a very primitive animal," Minta says of this member of the Mustelidae, or weasel, family, whose relatives include wolverines, ferrets, fishers, martens, skunks, mink, and otter. "For quite a few million years they have not changed morphologically," he says. Because they have successfully adapted to changes in habitat and food supply, these "primitive digging machines" are widely distributed.

In fact, the North American badger (*Taxidea taxus*) inhabits territory from Mexico to Canada, flourishes across parts of the western and north-central United States, and appears to continue to expand its range, according to badger authority Dr. John Messick, an associate professor of biology at Missouri Southern State College. The badger's adaptability has enabled it to adjust equally to elevations as low as Death Valley and as high as 9,000 to 10,000 feet or above in the Rockies.

In Montana, badgers inhabit all 56 counties—some not usually associated with badger habitat, like Lincoln, Flathead, and Mineral counties, says Flath. In fact, he says, he has never encountered a prairie dog town that hasn't been nailed by badgers. He has observed badgers in Douglas-fir habitats that receive more than 25 inches annual precipitation, as well as in Carbon County south of Bridger, which receives 10 inches or less. But badgers' density in Montana seems to be a little greater in a broad belt of prairie beginning in the south-central shortgrass around Billings, spreading north through Lewistown country, and bending northeasterly into mid-grass prairie toward Malta and Plentywood, Flath says. The area roughly coincides with the region where ground squirrels and prairie dog towns overlap.

STOUT AND COMPACT, THE BADGER RIDES LOW TO THE GROUND, often appearing to glide on its short, stocky legs. The toe-in gait and swinging head remind some observers of an ambling grizzly, in miniature. Sharp-curved claws measuring up to two inches attach to the five, partially webbed front toes of the badger's broad dark feet, equipping this mostly nocturnal carnivore with the tools of its fossorial (digging) life style. Like the grizzly's weapons, the badger's claws empower it to slash the skin from the head of an intruder with lightning speed, some observers vow.

Its own tough, nearly impervious skin is loosely attached, enabling the badger to move and turn in tight quarters and to "twist in its skin" nearly 180 degrees to free itself from the grip of an intruder, Minta says. Only the underbelly is vulnerable.

Even the topcoat, the badger's pelage, has been described as grizzled, its long, tri-colored guard hairs a salt-and-pepper mix of blacks, buffs, yellow-browns, or silver-grays covering a thicker underfur. The pelage drapes "kind of like a tortoise shell—like they're wearing a fur cape," Minta says. The hairs adeptly shed dirt and moisture and badgers can shake vigorously because of their loose skin.

Badgers' wedge-shaped heads are distinctively marked with a white or buff stripe running from snout to neck, longer in some populations. Black or dark brown fur surrounds the eyes and also creates a dark "sideburn" or badge between two sections of light fur. Minta suspects that the distinctive face, like that of other smaller carnivores, labels the badger as predator rather than prey. The dark fur surrounding the eyes may help to protect them during scuffles in tight, underground quarters. Badgers' eyesight is poor.

Some researchers say the patches or "badges" are responsible for the badger's name, but it could also derive from "*bêcheur,*" a French word meaning "digger."

THE BADGER DIGS for both food and shelter. An elongated snout aids in probing, and the badger roots much like a pig. Hair and other adaptations protect ears and eyes from dirt and debris. When pursuing prey, usually a rodent in its burrow, the badger identifies location with its acute senses of smell and hearing and excavates in a series of test sites, from shallow scrapes to deeper holes. If scent and sound indicate that the dig is empty, the badger quickly re-drills in another site. One study of badgers preying on gophers gave the hunt a 73% success rate.

Rodent of choice depends upon habitat, and might include prairie dogs, pocket gophers, or ground squirrels, but the badger supplements its diet with morsels such as snakes (reptiles are a staple in some populations), insects, and plants. It will even raid eggs from ground-nesting birds like meadowlarks and vesper sparrows, Flath says. Diet also varies seasonally, but the North American badger isn't nearly as omnivorous as its cousins (there are seven species throughout the world). The European badger (*Meles meles*), for example, survives on a staple of earthworms in the British Isles.

Also in contrast to *Meles*, a gregarious animal, the North American badger is a solitary creature. Although its home range will overlap with another badger, it lives alone except for mating and a brief period of weaning young. Its

vocalizations also appear more restricted than *Meles*, but the sounds include a sort of clicking, grunting, guttural purring and hissing, and high-pitched screaming. The European badger also appears better equipped for scent marking. How the American badger marks its territory isn't fully understood.

Given its disposition, claws, skin, predator markings, and acute senses of scent and hearing, the badger has few natural enemies. Badger and grizzly share the same primary enemy: man.

BADGER ALSO MIMICS BEAR in two curious physiological traits—delayed implantation of fertilized eggs and a semi-hibernation known as torpor.

Badgers in northern ranges mate from mid-July to early August, but a male and female do not stay together and a male will mate with several females in his home range. Then, like bears and most mustelids, the badger sow experiences delayed implantation, a state in which the embryo remains in the uterus without implanting, until January or February. Gestation then occurs rapidly, and the sow bears one to four cubs (usually two or three) in March or April. Although not fully understood in mustelids, Messick says, "Delayed implantation appears to synchronize birth with maximum food resources."

Cubs, bearing the distinctive markings almost from birth, are blind for the first 30 days and cannot dig effectively until about 60 days. The sow rears the young alone and before weaning them, she will have moved them to several natal dens, each with a larger-than-normal soil mound around the entrance. Given the badger's cantankerous nature, it's probably best that mom forestalls teen trouble by sending the cubs packing between June and August—in time for her to join in mating rituals.

One researcher, Dr. Hank Harlow at the University of Wyoming Department of Zoology and Physiology, extensively studies the badger's other curious quality, the winter state of semi-hibernation. Harlow says badgers are a "winter-lethargic animal" able to withdraw into a deep state of rest and inactivity underground known as torpor. Because their weight increases 25% to 30% by October, badgers would have sufficient reserves for the winter if they could hibernate like bears, Harlow says. Instead, they slip in and out of torpor, depressing their metabolism and dropping their body temperature to become inactive for a day or more, then recharging. "They conserve a considerable amount of energy, about 26% of their daily energy reserve," he explains.

At Jackson Hole, one of the coldest spots in the nation, Minta observed badgers in torpor as long as three months, with bouts of 45 days and 30 days not uncommon. Harlow describes how a friend in Wyoming once dug the foundation for a house in the semi-frozen prairie of early spring. The backhoe brought up a badger in torpor. Instead of coming out fighting, it lay in a daze for some time before it could scuffle away.

BECAUSE THE BADGER is mostly nocturnal, it may be nearly as elusive as the grizzly. Consciously try to find one, and everything seems to go against you, Minta says.

Researchers track badgers by implanting them with radio transmitters, but for the amateur wanting to maximize opportunities, Minta recommends a best time of year, best time of day, and most likely area. Badgers are more active during summer—the mating season—especially from late June through July and into August. "The males are just full of hormones, searching for females and marking," Minta says. Also, young may be seen with the mother, or later, striking out on their own. The single best time to see a badger is early morning, and the next best, evening, Minta says. Look for an area abundant with rodent holes (e.g., squirrel colonies) and look for fresh soil mounds, he advises.

In Montana, nongame biologist Flath says his luck has been best observing badgers in native habitat undisturbed by man and domestic grazing. FW&P's Blacktail Wildlife Management Area south of Dillon provides such a spot. Prairie dog towns in the belt of land around Lewistown north to Malta and east to Plentywood also should supply good digs.

UNLIKE GRIZZLY POPULATIONS, badger populations are stable and thriving. And unlike the grizzly, which has received special protection as a threatened species, the badger is an unregulated nongame species in Montana. Most states classify the badger a furbearer or predator and regulate its take, but abundant habitat in Montana and a slack market for badger pelts create little current need and no official move to manage the badger, according to Flath and state furbearer biologist Howard Hash. Only two things would likely change that status: greater demand for fur or excessively decreased prey resulting from conversion of habitat.

Trappers refer to the badger's lesser quality pelt as "hair" badger, but in higher latitudes, the prime winter coat of a North American badger can be excellent fur, says Steve Minta. With its ability to shed moisture, badger hair makes excellent artists' brushes and is used to tie flies, but the famous Potts flies sport badger hair imported from Asia at $350 a pound, for reportedly superior bristliness. All in all, unless pelt value skyrockets, biologists agree the fur market probably will not require the badger's reclassification in Montana.

Potshots, verbal and otherwise, aim at the badger's extensive excavating. Its burrows can damage farm equipment and irrigation systems and break the legs of horses and cattle, but man in turn alters habitat with land use changes, causes roadway deaths, and sometimes uses the badger for target practice.

"I think in Montana we're still operating somewhat off of the frontier spirit" in viewing some animals as pests, with the coyote the classic example, Hash says. But people are becoming more ecologically minded and "getting away from the business of plinking away" at animals for convenience, he says.

To Flath, other nongame animals, including the upland sandpiper, mountain plover, and burrowing owl, demand more immediate management attention than the badger.

Further studies will uncover more about this primitive digging machine. Meanwhile, Badger Chief's powerful chant makes his numbers thrive.■

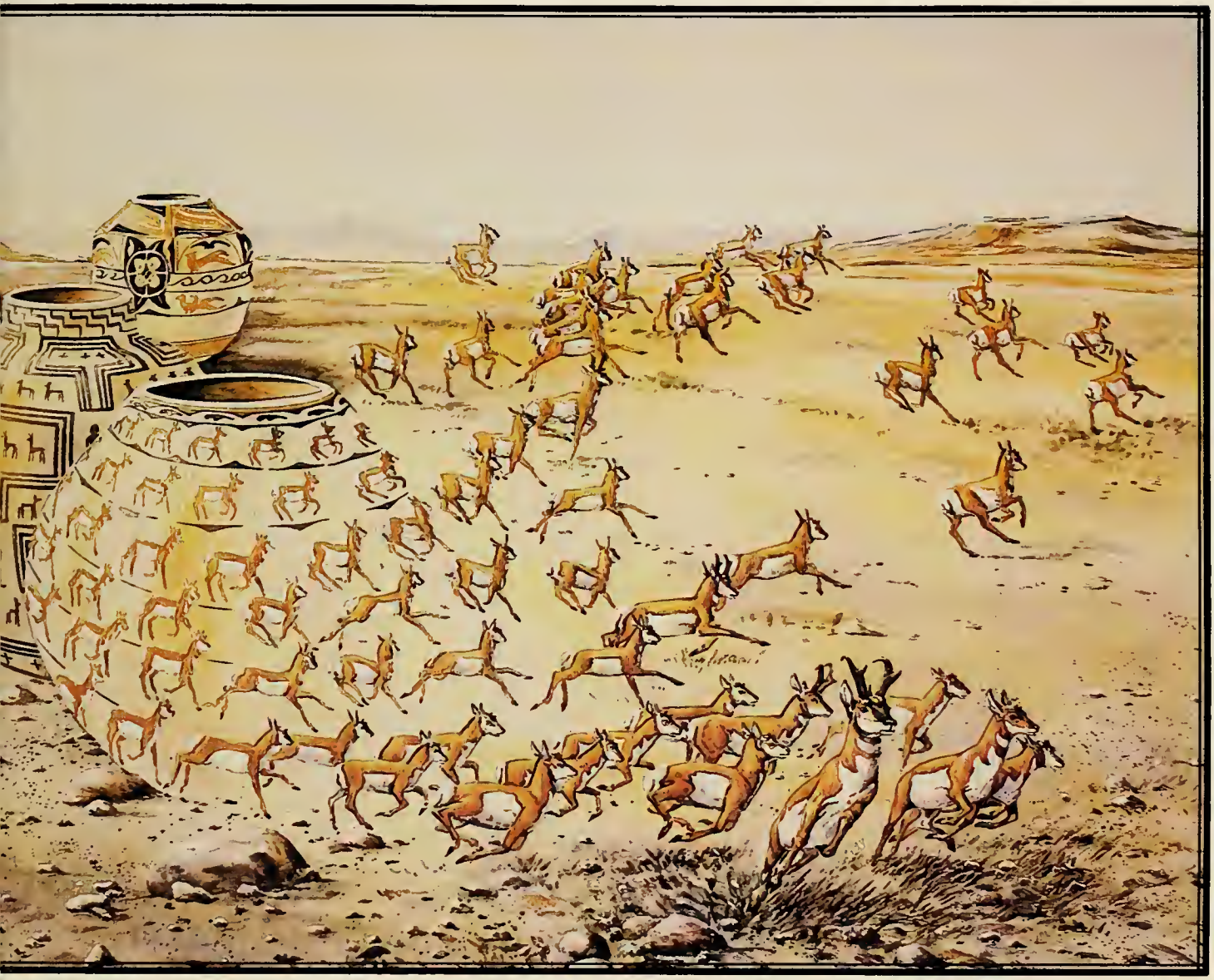
"THE LAST

"The potter sang with a voice
like clear water. Memories I kept
like beads in my pocket, told
them over and wore them thin."
—"Walking Into Silence," by Matthew Hansen

The Magic of Her Hands—*Robert A. Kercher*

Squaw with Bullboat—Charles M. Russell, Montana Historical Society, Museum Collection

BEST PLACE"

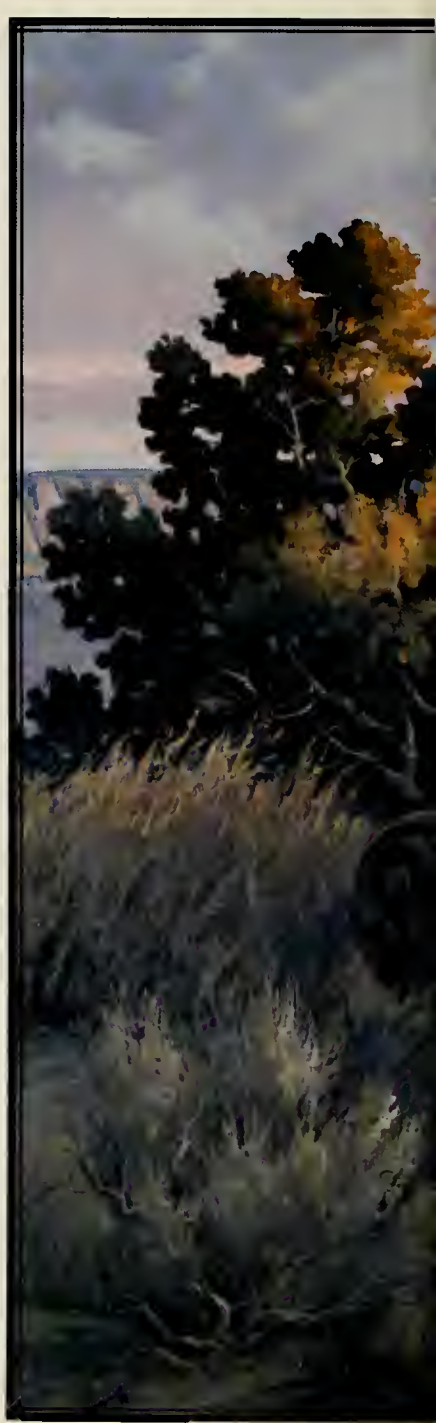


"The Last Best Place" is a big book. Weighing almost five pounds and spanning 1,182 pages, its stories, poems, reminiscences, and reports range across Montana's literary landscape. Editors William Kittredge and Annick Smith have included Native American stories and myths, sections from journals of explorers, stories from early pioneers, sketches about Butte, remembrances of the agricultural frontier, literature of modern Montana, and contemporary fiction and poetry. And it's hot—the first printing sold out almost before bookstore owners had a chance to place it on their shelves. Likewise, the second printing. And it's now in its third printing and still going strong. It's a perfect Montana book for a Centennial year—brimming with finely honed prose and poetry. Instead of telling you how great it is, we're going to show you. Consider what follows as a pictorial book review—some words to pique your interest in a "major Montana post card"—"The Last Best Place." The book is available from: Publicity Department, University of Washington Press, P.O. Box 50096, Seattle, WA 98145 ($39.95, plus $2 postage) or from the Montana Historical Society, 225 North Roberts, Helena, MT 59620 ($39.95, plus $1.50 postage).

Old Man Saw a Crane Flying Over—
Charles M. Russell, Montana Historical Society, gift of C.R. Smith

Calling the Buffalo at Dawn—*Jack Hines*

"In the way of the light, between it and me, I could see countless buffalo, see their sharp horns thick as the grass grows. I could smell their bodies and hear them snorting, ahead and on both sides of me. Their eyes, without number, were like little fires in the darkness of the hole in the ground, and I felt afraid among so many big bulls. The Man-person must have known this, because he said, 'Be not afraid, Plenty-coups. It was these Persons who sent for you. They will not do you harm.' "—**"Vision in the Crazy Mountains," Plenty-coups, Chief of the Crows, transcribed by Frank B. Linderman**



"The hills and river Clifts which we passed today exhibit a most romantic appearance. The bluffs of the river rise to the hight of from 2 to 300 feet and in most places nearly perpendicular; they are formed of remarkable white sandstone which is sufficiently soft to give way readily to the impression of water;...The water in the course of time in decending from those hills and plains on either side of the river has trickled down the soft sand clifts and woarn it into a thousand grotesque figures, which with the help of a little immagination and an oblique view, at a distance are made to represent eligant ranges of lofty freestone building, having their parapets well stocked with statuary...."—**"Original Journals of the Lewis and Clark Expedition, 1804-1806," edited by Reuben Gold Thwaites, Meriwether Lewis, Friday, May 31, 1805**

White Bears and White Cliffs—*Robert F. Morgan*

Flatboat on River, Fort in Background (Fort Union)—Charles M. Russell, Montana Historical Society, gift of C.R. Smith

The Trapper—Charles M. Russell, Montana Historical Society, Mackay Collection

Last Stage Out of Yellowstone—*Gary Carter*

"But more so—as we drove I imagined Lewis and Clark and Catlin and Bodmer and even Audubon up to Fort Union on the last voyage of his life in 1843, along with every wagon train, ox-cart, cattle drive, and trainload of honyockers, all in pursuit of that absolute good luck which is some breathing time in a commodious place where the best that can be is right now. In the picture book of my imagination I was seeing a Montana composed of major post cards. The great river sliding by under the bridge was rich with water from the Sun River drainage, where elk and grizzly were rumored to be on the increase."—**"Drinking and Driving," from "Owning It all," by William Kittredge**

Centennial